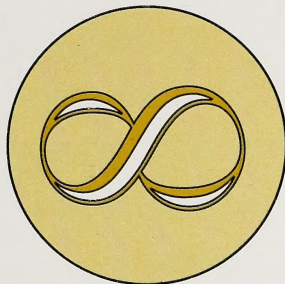




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MATHEMATIC



MODULE 4 ALGEBRA



Alberta
EDUCATION

LEARNING FACILITATOR'S MANUAL





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Mathematics 8

Module 4: Algebra

LEARNING FACILITATOR'S MANUAL

Note

This Mathematics Learning Facilitator's Manual contains answers to teacher-assessed assignments and the final test; therefore, it should be kept secure by the teacher. Student's should not have access to these assignments or the final test until they are assigned in a supervised situation. The answers should be stored securely by the teacher at all times.

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Module 4
Algebra
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Module Introduction	Page 1
Section 1: Getting Set	3
Section 2: Translating Words and Phrases	17
Section 3: Evaluating Algebraic Expressions	25
Section 4: Simplifying Algebraic Expressions	37
Section 5: Translating Sentences	45
Section 6: Equations	49
Section 7: Solving Equations Using Additive Inverses	59
Section 8: Solving Equations Using Multiplicative Inverses	67
Section 9: Solving More Equations Using Multiplicative Inverses	73
Section 10: Solving Equations Using Additive and Multiplicative Inverses ..	81
Section 11: Equations with Two Variables	89
Section 12: Relations	97
Section 13: Summary	107
Module Conclusion	109
Assignment	110

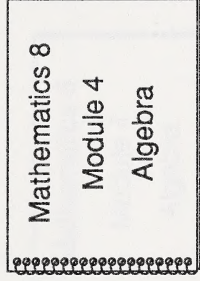
MODULE INTRODUCTION

What Lies Ahead

In the Module Introduction you will preview the module and learn how the module will be evaluated.

Gathering Materials

For this section the student will need these items.



Guiding the Student

- Emphasize to the students that the goal is to preview the module.
- Discuss the learning process, time management, and evaluation with the students. See the following suggestions.

The Learning Process

Each section of Module 4 deals with a different skill involving algebra.

Sections have several activities.

- Introductory Activities
- Practice Activities
- Extra Practice
- Concluding Activities

Remind the students that they will not be expected to do all the activities. You will help them decide what to do.

Time Management

Decide how long the student will need to complete the module. (The average student should spend about 7 weeks in a 40-week year to complete the module. It is recommended that students spend no more than 1 hour at a time doing mathematics.)

Evaluation

Explain to the students how the module will be evaluated.

GETTING SET

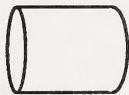
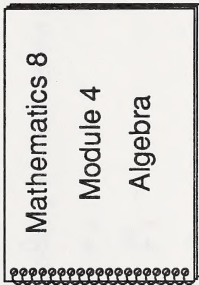
What Lies Ahead

This section will pretest the following skills.

- using variables in an algebraic expression
- evaluating expressions for a given value of the variable
- simplifying algebraic expressions by combining like terms
- using variables to write mathematical expressions and sentences
- solving equations using additive inverses
- solving equations using multiplicative inverses
- solving equations using additive and multiplicative inverses
- generating a set of ordered pairs
- plotting ordered pairs
- producing a graph
- describing relations

Gathering Materials

For this section the student will need these items.



Guiding the Student

- Emphasize to the students that the goal of this section is to discover their strengths and weaknesses.
- Help the students check their answers to the pretest. It is not necessary to correct any errors at this time. See the last page of this section for further directions.

Pretest

- Translate each English phrase into a mathematical expression.
 - five times Sam's age
 - Helen's mass decreased by two kilograms
 - the distance from John's house to work divided by two
 - ten dollars more than Ruth's wage
 - the sum of the length and width of the house
- Use learning aids (cylinders and counters) to do the following.
 - Model x and evaluate if $x = -1$.
 - Model $-x$ and evaluate if $x = -1$.
 - Model $x + 2$ and evaluate if $x = -1$.
 - Model $x + y$ and evaluate if $x = -1$ and $y = +1$.
 - Model $x + xy$ and evaluate if $x = -1$ and $y = +1$.

Suggested Answers

- $5 \times a$ or $5a$
 - $m - 2$
 - $d \div 2$ or $\frac{d}{2}$
 - $w + 10$
 - $l + w$
- Modelling is shown at the end of this section.
 - -1
 - $+1$
 - $+1$
 - 0
 - -2

3. Use paper and pencil methods to evaluate the following expressions.

a. $2a + 7$ if $a = 3$

b. $n^2 - 2$ if $n = -5$

c. $e - 3d$ if $d = 2$ and $e = -2$

d. $3y + z$ if $y = \frac{1}{3}$ and $z = \frac{1}{2}$

4. Use learning aids (cylinders and counters) to model and simplify the following expressions.

a. $t + t + t + t$

b. $s + 2 - 3 + 1$

c. $a + 2 + a - 5$

d. $a + b - 3 + a$

e. $b + c - 1 - b$

5. Use paper and pencil methods to simplify the following expressions.

a. $3f - 1 + 2 - f$

b. $2a + 3ab + a - b$

c. $-cd + 3c^2 + cd - d$

d. $2a - 2 + 5a$

3. a. 13

b. 23

c. -8

d. $1\frac{1}{2}$

4. Modelling is shown at the end of this section.

a. $4t$

b. s

c. $2a - 3$

d. $2 + b - 3$

e. $c - 1$

5. a. $2f + 1$

b. $3a + 3ab - b$

c. $3c^2 - d$

d. $7a - 2$

6. Translate the following sentences into equations.

- a. Two times a number plus three results in thirteen.
- b. Linton's age is six less than Evon's.
- c. Katsuta's mass increased by 10 kg is the same as Hayanu's.
- d. The length of the building squared is five less than the width of the building.

7. Model the following equations. Then solve the equations using inspection or guess-check-revise methods. Verify the solutions.

- a. $x + 2 = 8$
- b. $3d = 12$
- c. $2m - 1 = 7$
- d. $5n = 2n - 9$
- e. $2y + 3 = y - 1$

6. a. $2n + 3 = 13$

b. $e - 6 = \ell$

c. $k + 10 = h$

d. $\ell^2 = w - 5$

7. Modelling is shown at the end of this section.

a. $x = +6$

b. $d = +4$

c. $m = +4$

d. $n = -3$

e. $y = -4$

8. Solve the following equations using inspection or guess-check-revise methods. Verify using paper and pencil methods.

a. $3w + 2 = 11$

b. $5x + 1 = 3x - 9$

9. Solve $x + 3 = 8$ using additive inverses. Verify the solution.

a. Use models.

b. Use paper and pencil methods.

10. Solve $3y = -12$ using multiplicative inverses. Verify the solution.

a. Use models.

b. Use paper and pencil methods.

11. Solve the following using paper and pencil methods. Verify the solutions.

a. $\frac{z}{3} = 5$

b. $\frac{a}{2} = \frac{7}{8}$

12. Solve $3d + 5 = 11$ using inverses. Verify the solution.

a. Use models.

b. Use paper and pencil methods.

8. a. $w = 3$

b. $x = -5$

9. a. Modelling is shown at the end of this section.

b.
$$\begin{array}{r} x + 3 = 8 \\ -3 = -3 \\ \hline x = 5 \end{array}$$

10. a. Modelling is shown at the end of this section.

b. $3y = -12$

$$\begin{array}{r} \frac{1}{3} \times 3y = \frac{1}{3} \times (-12) \\ y = -4 \end{array}$$

11. a. $r = 15$

b. $n = 1\frac{3}{4}$

12. a. Modelling is shown at the end of this section.

b.
$$\begin{array}{r} 3d + 5 = 11 \\ -5 = -5 \\ \hline 3d = 6 \end{array}$$

$$\frac{1}{3} \times 3d = \frac{1}{3} \times 6$$

$$d = 2$$

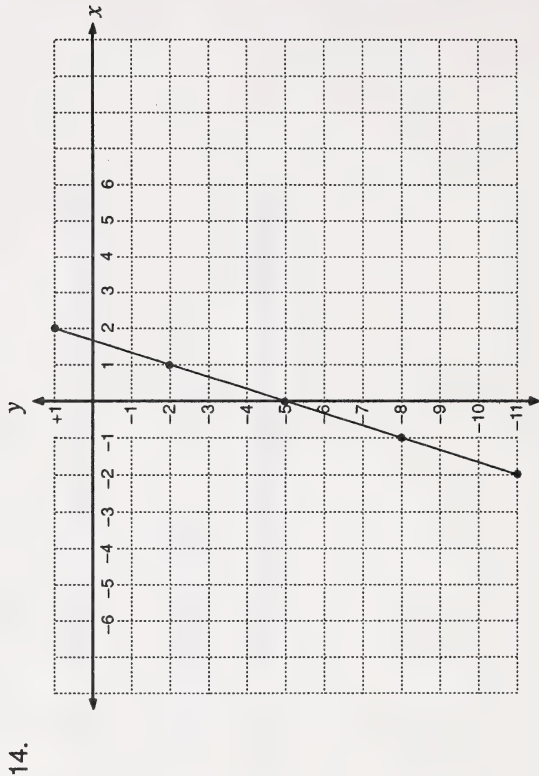
13. Complete the following table of values.

$y = 3x - 5$	
x	y
-2	
-1	
0	
1	
2	

13.

$y = 3x - 5$	
x	y
-2	-11
-1	-8
0	-5
1	-2
2	1

14. Graph $y = 3x - 5$.



15. Jerrit unpacks cans from boxes at a grocery store.

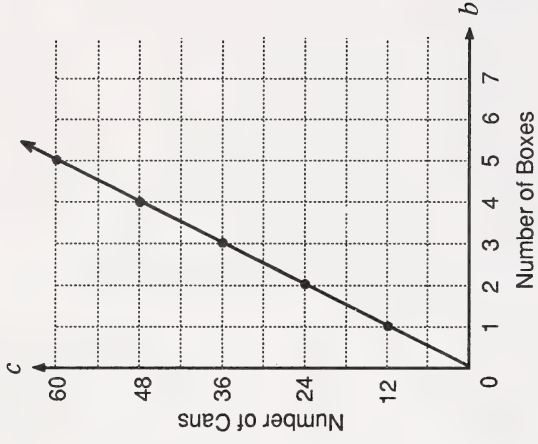
Number of Boxes (<i>b</i>)	Relation	Number of Cans (<i>c</i>)
1	12×1	12
2	12×2	24
3	12×3	36
4	12×4	48
5	12×5	60

- a. Use words to describe the relationship.
- b. Write an equation to describe the relationship.
- c. Use ordered pairs to describe the relationship.

- 15.
- a. The number of cans is twelve times the number of boxes.
 - b. $c = 12b$
 - c. $(1, 12), (2, 24), (3, 36), (4, 48), (5, 60), \dots$

- d. Use a graph to describe the relationship.

d.

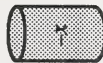


Modelling

2. a. Model
- x
- .

Evaluate if $x = -1$.The value of the expression is -1 .

- b. Model
- $-x$
- .

Evaluate if $x = -1$. $-x$ is opposite of x .The value of the expression is $+1$.

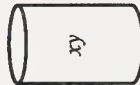
- c. Model
- $x + 2$
- .


Evaluate if $x = -1$.The value of the expression is $+1$.



- d. Model
- $x + y$
- .

Evaluate if $x = -1$ and $y = +1$.The value of the expression is 0 .

- e. Model
- $x + xy$
- .

Evaluate if $x = -1$ and $y = +1$.If $x = -1$ and $y = +1$, $xy = (-1) \times (+1) = -1$.The value of the expression is -2 .

4. a. Model $t + t + t + t$.

 This expression can be called $4t$.


- b. Model $s + 2 - 3 + 1$

 Remove the zero pairs.


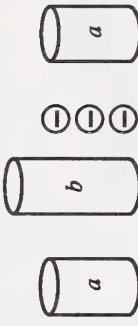
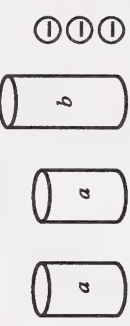
This expression is s .

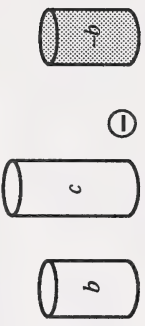
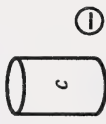
- c. Model $a + 2 + a - 5$.


Group the cylinders labelled a .



- Remove the zero pairs.

 This expression is $2a - 3$.

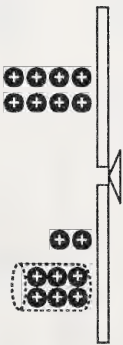
- d. Model $a + b - 3 + a$.

 Group the cylinders labelled a .

 This expression is $2a + b - 3$.

- e. Model $b + c - 1 - b$.

 Remove the zero pairs.

 The expression is $c - 1$.

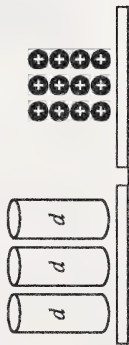
7. a. Model $x + 2 = 8$.



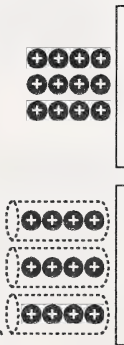
Verify $x = +6$.



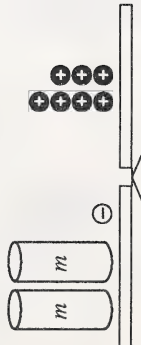
- b. Model $3d = 12$.



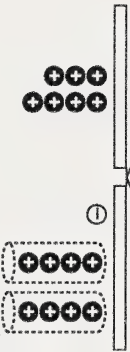
Verify $d = +4$.



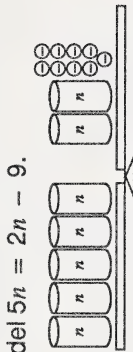
- c. Model $2m - 1 = 7$.



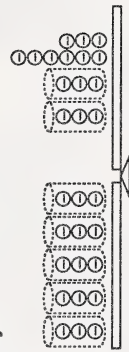
Verify $m = +4$.



d. Model $5n = 2n - 9$.



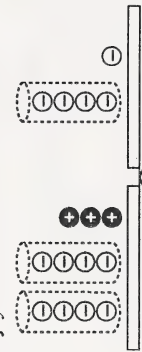
Verify $n = -3$.



e. Model $2y + 3 = y - 1$.



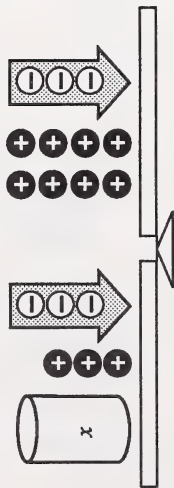
Verify $y = -4$.



9. a. Model $x + 3 = 8$.



Add -3 to both sides.



Remove the zero pairs.

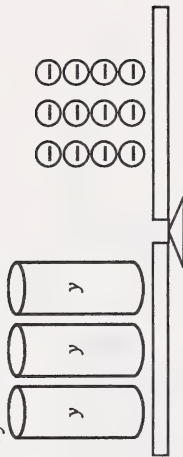


Verify $x = +5$.

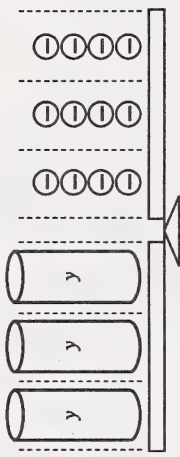


LS = RS

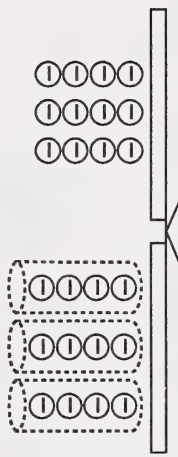
10. a. Model $3y = -12$.



Divide each side into 3 groups.

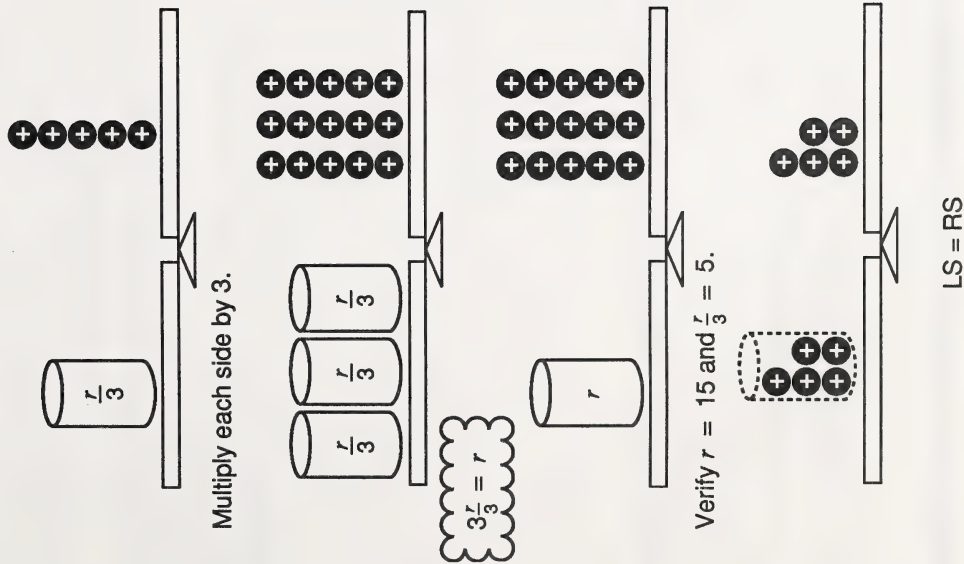


Verify $y = -4$.

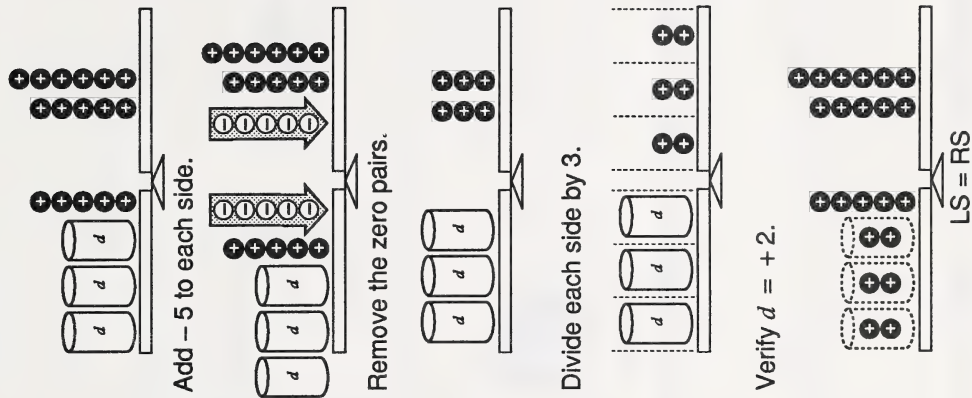


LS = RS

11. a. Model $\frac{r}{3} = 5$.



12. a. Model $3d + 5 = 11$.



TRANSLATING WORDS AND PHRASES

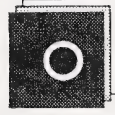
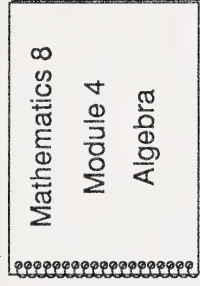
What Lies Ahead

In this section the student will learn these skills.

- translating English phrases into mathematical expressions
- interpreting the meaning of variables and algebraic expressions

Gathering Materials

For this section the student will need these items.



BRITANNICA: Problem Solving in Algebra

(optional)

Guiding the Student

- Emphasize to the students the goal of this section.
- Help the students check their answers to the activities in this section and correct any errors.

Introductory Activities

Translate each English phrase into a mathematical expression

1. seven baseballs increased by nine baseballs
2. the difference between nine poodles and six poodles
3. five groups of fifteen children
4. forty-eight pizzas divided by sixteen people
5. three more than the difference of five years and two years
6. thirty-two tapes decreased by eight groups of three tapes

Suggested Answers

1. $7 + 9$
2. $9 - 6$
3. 5×15
4. $48 \div 16$
5. $3 + 5 - 2$
6. $32 - 8 \times 3$

Practice Activities

1. Translate the following English expressions into mathematical expressions containing variables.

- a. the sum of a number and three
- b. three subtracted from a number
- c. two thirds of a number
- d. a number squared
- e. five more than a number
- f. twice a number increased by six
- g. one less than two thirds of a number
- h. four more than one half of a number
- i. the difference between eight and a number cubed

Suggested Answers

1.
 - a. $n + 3$
 - b. $n - 3$
 - c. $\frac{2}{3}n$
 - d. n^2
 - e. $n + 5$
 - f. $2n + 6$
 - g. $\frac{2}{3}n - 1$
 - h. $\frac{1}{2}n + 4$
 - i. $8 - n^3$

Print Alternative

2. Translate the following situations into mathematical phrases.

- | | |
|---|-------------------|
| a. Marco's age increased by two years | 2. $a + 2$ |
| b. twice the distance from Muriel's house to school | b. $2d$ |
| c. a number squared | c. n^2 |
| d. five times the price of a car | d. $5p$ |
| e. twice Amar's salary plus three dollars | e. $2s + 3$ |
| f. one half of the price | f. $\frac{1}{2}p$ |
| g. a boy's age twelve years from now | g. $a + 12$ |
| h. the sum of Ardith's mass and twenty-five kilograms | h. $m + 25$ |

Computer Alternative

3. Do Introductory Lesson 1 of *BRITANNICA: Problem Solving in Algebra*.
3. Computer corrected

Concluding Activities

1. Read the following phrases aloud.

- a. three times four, less two
- b. three times, four less two
- c. the sum of two, and five times three
- d. the sum of two and five, times three

2. How did you translate the commas when you read the phrases in Question 1?

3. Mathematicians sometimes use brackets to show order of operations. Translate the expressions in Question 1 into mathematical expressions containing brackets.

Suggested Answers

2. The commas were translated as pauses.

3. a. $(3 \times 4) - 2$
 b. $3 \times (4 - 2)$
 c. $2 + (5 \times 3)$
 d. $3 \times (2 + 5)$

4. Translate the following English expressions into algebraic expressions.

- a. sixteen times, two more than a number
- b. sixteen times two, more than a number
- c. four times the length, plus eight centimetres
- d. four times, the length plus eight centimetres

- 4. a. $16(2 + n)$
- b. $(16 \times 2) + n$
- c. $4\ell + 8$
- d. $4(\ell + 8)$ or $4 \times (\ell + 8)$

5. Remember that subtraction is sometimes translated in a different order. Translate the following English expressions into mathematical expressions.

- a. the difference of three, and two times a number
- b. the difference of three and two, times a number
- c. four less than three, times a number
- d. four less than, three times a number

- 5. a. $3 - 2n$
- b. $(3 - 2)n$ or $(3 - 2) \times n$
- c. $(3 - 4)n$ or $(3 - 4) \times n$
- d. $3n - 4$

EVALUATING ALGEBRAIC EXPRESSIONS

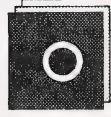
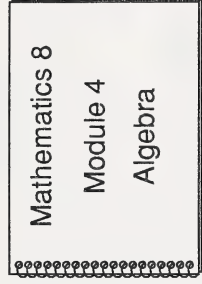
What Lies Ahead

In this section the student will learn these skills.

- modelling algebraic expressions
- evaluating algebraic expressions using models
- evaluating algebraic expressions using paper and pencil methods

Gathering Materials

For this section the student will need these items.



(optional)

*Computer Drill and Instruction:
Mathematics, Level D (SRA)*




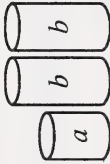
Guiding the Student

- Emphasize to the students the goal of this section.
- Help the students check their answers to the activities in this section and correct any errors.

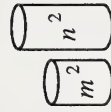
Introductory Activities

1. a. Model $x + 5$.
 b. Evaluate $x + 5$ if $x = +3$.
 c. Evaluate $x + 5$ if $x = -2$.
2. a. Model $3 - y$.
 b. Evaluate $3 - y$ if $y = +4$.
 c. Evaluate $3 - y$ if $y = -1$.
3. a. Model $3z - 5$.
 b. Evaluate $3z - 5$ if $z = -2$.
 c. Evaluate $3z - 5$ if $z = +3$.
4. a. Model $a + 2b$.
 b. Evaluate $a + 2b$ if $a = -1$ and $b = +3$.
 c. Evaluate $a + 2b$ if $a = +2$ and $b = -2$.

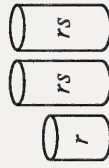
Suggested Answers

1. a. 
 b. $+8$
 c. $+3$
2. a. 
 b. -1
 c. $+4$
3. a. 
 b. -11
 c. $+4$
4. a. 
 b. $+5$
 c. -2

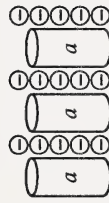
5. a. Model $m^2 + n^2$.
 b. Evaluate $m^2 + n^2$ if $m = +2$ and $n = +3$.
 c. Evaluate $m^2 + n^2$ if $m = -1$ and $n = 0$.
6. a. Model $r + 2rs$.
 b. Evaluate $r + 2rs$ if $r = -1$ and $s = +2$.
 c. Evaluate $r + 2rs$ if $r = +3$ and $s = -1$.
7. a. Model $3(a - 5)$.
 b. Evaluate $3(a - 5)$ if $a = +1$.
 c. Evaluate $3(a - 5)$ if $a = -1$.



5. a.

b. $+13$ c. $+1$ 

6. a.

b. -5 c. -3 

7. a.

b. $+12$ c. -18

Suggested Answers

Practice Activities

Computer Alternative



1. Do Lesson 5 of the *Pre-Algebra* disk from the package *Computer Drill and Instruction: Mathematics, Level D* (SRA).

Remember, if you need help, press the SHIFT key and the ? key.

1. Computer corrected

Print Alternative



2. a. 18

- b. 1.2

- c. 1

2. a. Evaluate $n + 10$ if $n = 8$.

- b. Evaluate $2p$ if $p = 0.6$.

- c. Evaluate $5r - 2$ if $r = \frac{3}{5}$.

d. Evaluate $3 + 4s$ if $s = 0.5$.

d. 5

e. Evaluate $2n^2 + 1$ if $n = 4$.

e. 33

f. Evaluate $0.5n - 0.1$ if $n = 2$.

f. 0.9

Concluding Activities

1. Complete the following tables. Evaluate the first three values and then use a pattern to help you find the last three values.

a.

a	$a + 2$
1	
2	
3	
4	
5	
6	

b.

b	$4b - 1$
1	
2	
3	
4	
5	
6	

Suggested Answers

a.

a	$a + 2$	Pattern
1	3	+1
2	4	+1
3	5	+1
4	6	+1
5	7	+1
6	8	+1

b.

b	$4b - 1$	Pattern
1	3	+4
2	7	+4
3	11	+4
4	15	+4
5	19	+4
6	23	+4

c.

c	$2c$
1	
2	
3	
4	
5	
6	

c.

c	$2c$	Pattern
1	2	+ 2
2	4	+ 2
3	6	+ 2
4	8	+ 2
5	10	+ 2
6	12	+ 2

d.

d	$3d + 2$
1	
2	
3	
4	
5	
6	

d.

d	$3d + 2$	Pattern
1	5	+ 3
2	8	+ 3
3	11	+ 3
4	14	+ 3
5	17	+ 3
6	20	+ 3

e.

f	$5f - 1$
1	
2	
3	
4	
5	
6	



e.

f	$5f - 1$	Pattern
1	4	+ 5
2	9	+ 5
3	14	+ 5
4	19	+ 5
5	24	+ 5
6	29	+ 5


2. How are the patterns in Question 1 similar to the algebraic expressions?

Hint: $a + 2 = 1a + 2$.


2. In Question 1 the number in the pattern is also the numerical coefficient of the variable, or the number with which the variable is multiplied.


3. Each of the following algebraic expressions has a missing number shown by . Use the table of values to find each value of .

a.

k	 $k - 3$
1	1
2	5
3	9
4	13

3. a.

k	 $k - 3$	Pattern
1	1	+ 4
2	5	+ 4
3	9	+ 4
4	13	+ 4

So, using the pattern,
 = 4.

b.

y	$y + 1$
1	7
2	13
3	19
4	25

b.

y	$y + 1$
1	7
2	13
3	19
4	25

Pattern

+6
+6
+6

So, using the pattern,
 $\square = 6$.

c.

d	$d - 1$
1	1
2	3
3	5
4	7

c.

d	$d - 1$
1	1
2	3
3	5
4	7

Pattern

+2
+2
+2

So, using the pattern,
 $\square = 2$.

d.

x	$x + 4$
1	7
2	10
3	13
4	16

d.

x	$x + 4$
1	7
2	10
3	13
4	16

Pattern

+3
+3
+3

So, using the pattern,
 $\square = 3$.

4. Complete the following tables. Evaluate the first three variables and then use a pattern to help you find the last three values.

a.

a	a^2
1	
2	
3	
4	
5	
6	

b.

b	$b^2 + 3$
1	
2	
3	
4	
5	
6	

4. a.

a	a^2	Pattern
1	1	
2	4	+3
3	9	+5
4	16	+7
5	25	+9
6	36	+11

b.

b	$b^2 + 3$	Pattern
1	4	
2	7	+3
3	12	+5
4	19	+7
5	28	+9
6	39	+11

c	$c^2 - 1$
1	
2	
3	
4	
5	
6	

c.

c	$c^2 - 1$	Pattern
1	0	
2	3	+3
3	8	+5
4	15	+7
5	24	+9
6	35	+11

c.

5. Complete the following statements.

- In Question 1 the exponent of each variable is , and you found the difference to obtain the $a^1 + 2 = a^1 + 2$ and $4b^1 - 1 = 4b^1 - 1$.
Hint: $a + 2 = a^1 + 2$ and $4b - 1 = 4b^1 - 1$.
- In Question 4 the exponent of each variable is , and you found the difference to obtain the pattern.

- In Question 1 the exponent of each variable is 1, and you found the difference once to obtain the pattern.
 - In Question 4 the exponent of each variable is 2, and you found the difference twice to obtain the pattern.

6. Each of the following algebraic expressions has the exponent of the variable missing. Use the table of values to find the missing exponent.

a.

a	$a^{\text{■}} + 1$
1	2
2	5
3	10
4	17

6. a.

a	$a^{\text{■}} + 1$	Pattern
1	2	
2	5	+3
3	10	+5
4	17	+7

The difference was found twice, so $\text{■} = 2$ and $a^2 + 1 = a^2 + 1$.

b.

b	$b^{\text{■}} - 1$
1	0
2	1
3	2
4	3

b.

b	$b^{\text{■}} - 1$	Pattern
1	0	
2	1	+1
3	2	+1
4	3	+1

The difference was found once, so $\text{■} = 1$ and $b^1 - 1 = b^1 - 1$, or $b - 1$.

SIMPLIFYING ALGEBRAIC EXPRESSIONS

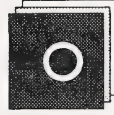
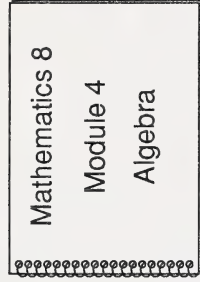
What Lies Ahead

In this section the student will learn these skills.

- identifying like terms and unlike terms
- simplifying algebraic expressions using models
- simplifying algebraic expressions using paper and pencil methods

Gathering Materials

For this section the student will need these items.



(optional)

*Computer Drill and Instruction:
Mathematics, Level D (SRA)*

Guiding the Student

- Emphasize to the students the goal of this section.
- Help the students decide what to do in this section.
- Help the students to check their answers to the activities in this section and correct any errors.

Introductory Activities

Use models to simplify the following expressions.

1. $m + m$

2. $d + 2 + d - 4$

3. $y + y + 3 + x + 1 + x - 6 + x$

4. $a + y + a - 3$

5. $-4 + n + n + 7 - 6 + n$

6. $j + 3 + j + 3 + j + 3$

Suggested Activities

See the models on the following pages.

1. $2m$

2. $2d - 2$

3. $2y + 3x - 2$

4. $2a + y - 3$

5. $3n - 3$

6. $3j + 9$

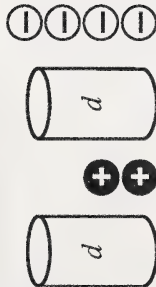
Modelling

1. Model
- $m + m$
- .

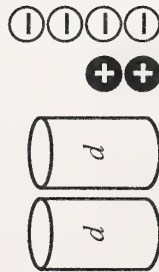


$$\text{So, } m + m = 2m.$$

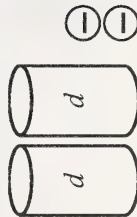
2. Model
- $d + 2 + d - 4$
- .



Regroup.

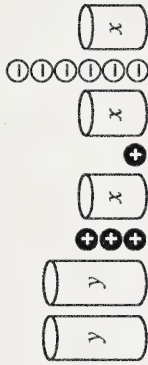


Remove the zero pairs.

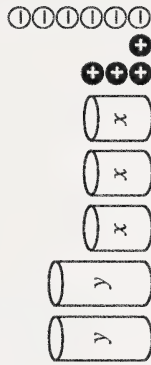


$$\text{So, } d + 2 + d - 4 = 2d - 2.$$

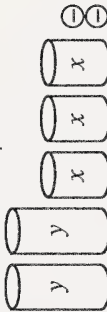
3. Model
- $y + y + 3 + x + 1 + x - 6 + x$
- .



Regroup.

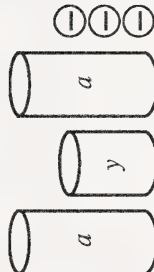


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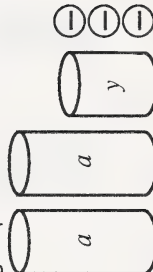


$$\text{So, } y + y + 3 + x + 1 + x - 6 + x = 2y + 3x - 2.$$

4. Model
- $a + y + a - 3$
- .

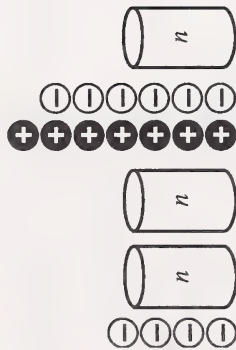


Regroup.

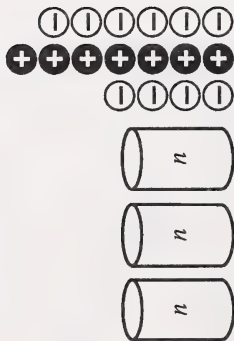


$$\text{So, } a + y + a - 3 = 2a + y - 3.$$

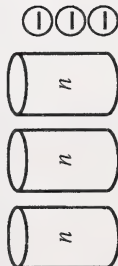
5. Model $-4 + n + n + n + 7 - 6 + n$.



Regroup.

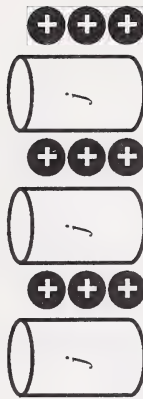


Remove the zero pairs.

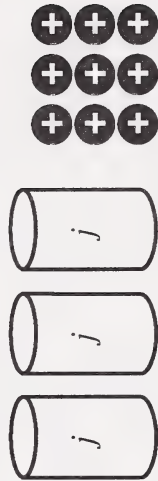


So, $-4 + n + n + n + 7 - 6 + n = 3n - 3$.

6. Model $j + 3 + j + 3 + j + 3$.



Regroup.



So, $j + 3 + j + 3 + j + 3 = 3j + 9$.

Practice Activities

Computer Alternative



1. Do Lesson 9 of the *Pre-Algebra* disk from the package *Computer Drill and Instruction: Mathematics, Level D* (SRA).

Suggested Answers

1. Computer corrected

Print Alternative

2. Simplify by collecting the like terms



- | | |
|-------------------------------------|-------------------------|
| a. $2f + 5f$ | 2. a. $7f$ |
| b. $5x - 2x + 4z - 2z$ | b. $3x + 2z$ |
| c. $3a - 2a^2 - 5a$ | c. $-2a^2 - 2a$ |
| d. $3m - 2 + 4p + 7m + 7n - 13$ | d. $10m + 7n + 4p - 15$ |
| e. $2a + 3b + 2ab + 5b - 8ab$ | e. $2a - 6ab + 8b$ |
| f. $-6cd + 3c^2 + 2d^2 + cd + 4d^2$ | f. $3c^2 - 5cd + 6d^2$ |

Extra Practice

1. Use the words **like** and **unlike** to describe each of the following pairs.
 - a. $3x$ and x
 - b. $4y$ and $4x$
 - c. $-2a^2$ and a
 - d. 8 and $\frac{1}{5}$
2. Simplify the following expressions.
 - a. $6 + 4p - 3 - 6p$
 - b. $3a - a^2 + 5a - 4a^2$
 - c. $6a - 4ab + ab - 7a + 8a$
 - d. $-4p + 6n - 3n + 7p - 6p + 5n$
 - e. $4w - 7 + 3x + 5w + 13x - wx$

Suggested Answers

1.
 - a. like
 - b. unlike
 - c. unlike
 - d. like
2.
 - a. $-2p + 3$
 - b. $-5a^2 + 8a$
 - c. $7a - 3ab$
 - d. $8n - 3p$
 - e. $9w + 16x - wx - 7$

Concluding Activities

1. Which of the following expressions are equivalent?

- $a^2 - b^2 + 2b^2 - a^2$
- $2a^2 + 3a - 2a^2$
- $3a - b + a + 2b$
- $-3b + 3a + 4b - 2a$
- $2a - b - a + 2b$
- $6a - 8 + 3a + 5$
- $3a + a + 4b - 3b$
- $2ab - b^2 - 2ab + 2b^2$
- $4a + 2b - a - 2b$
- $a^2 + a - a^2 + 2a$

Suggested Answers

1. Expressions a. and h. are equivalent.
 Expressions b., i., and j. are equivalent.
 Expressions c. and g. are equivalent.
 Expressions d. and e. are equivalent.

The expressions can each be simplified as shown:

- $1b^2$
- $3a$
- $4a + b$
- $a + b$
- $a + b$
- $9a - 3$
- $4a + b$
- b^2
- $3a$
- $3a$

2. Evaluate the following.

a. $2m + 6m$, if $m = 2$

b. $5q - 2q$, if $q = 2.7$

c. $5t - 3t + 2t$, if $t = \frac{1}{4}$

d. $3f - g - f + g$, if $f = 2$ and $g = 5$

2. a. 16

b. 8.1

c. 1

d. 4

3. Collect the like terms in Question 2. Then evaluate the simplified expressions.

3. a. $8m$, 16

b. $3q$, 8.1

c. $4t$, 1

d. $2f$, 4

4. What do you notice about the answers in Questions 2 and 3?

4. The answers in Questions 2 and 3 are the same. In other words, you can evaluate before or after simplifying an expression.

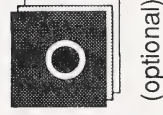
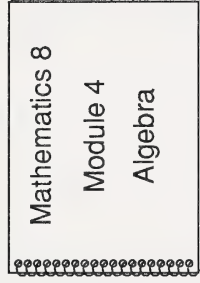
TRANSLATING SENTENCES

What Lies Ahead

- In this section the student will learn this skill.
- translating English sentences into equations

Gathering Materials

For this section the student will need these items.



*BRITANNICA: Problem Solving in
Algebra*

(optional)

Guiding the Student

- Emphasize to the students the goal of this section.
- Help the students decide what to do in this section.

- Help the students check their answers to the activities in this section and correct any errors.

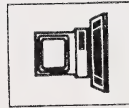
Introductory Activities

Print Alternative



1. Write each of the following sentences as an equation.
 - a. Twelve decreased by a number is four.
 - b. The sum of the number and one half of the number is equal to forty-eight.
 - c. A number tripled decreased by 2 results in -7 .
 - d. Three kilograms more than Bob's mass is fifty-two kilograms.
 - e. Five dollars more than double Marnie's money is \$79.
 - f. Nine less than half the total number of newspapers delivered is twenty-seven newspapers.

Computer Alternative



2. Do Introductory Lessons 5 and 6 of *BRITANNICA: Problem Solving in Algebra*.

Suggested Answers

1. a. $12 - n = 4$
- b. $n + \frac{1}{2}n = 48$
- c. $3n - 2 = -7$
- d. $3 + m = 52$
- e. $2m + 5 = 79$
- f. $\frac{1}{2}n - 9 = 27$

2. Computer corrected

Practice Activities

Write an equation for each of these problems.

1. Six times a number plus ten equals forty. What is the number?
2. A number increased by two and a half equals seven. What is the number?
3. The price of six hockey tickets plus eight dollars for refreshments equals eighty dollars. How much did each hockey ticket cost?
4. Chandia used an average of six sheets of loose-leaf paper each day. At the end of the semester she had used six hundred fifty-four sheets of paper. How many days long was the semester?
5. Zaib now has thirty-seven tropical fish in his aquarium. This is seven less than four times the number of fish that he had when he started his aquarium. How many tropical fish did Zaib have at the start?

Suggested Answers

1. $6n + 10 = 40, n = 5$
2. $n + 2\frac{1}{2} = 7, n = 4\frac{1}{2}$
3. $6n + 8 = 80, n = 12$
4. $6n = 654, n = 109$
5. $4n - 7 = 37, n = 11$

Concluding Activities

Translate the following. Use brackets where needed.

1. The square of nine, minus three, results in seventy-eight.
2. The square of, nine minus three, gives thirty-six.
3. The sum of eight and two, times a number is sixty.
4. The sum of eight, and two times a number equals twenty.

Suggested Answers

1. $9^2 - 3 = 78$
2. $(9 - 3)^2 = 36$
3. $n \times (8 + 2) = 60, (8 + 2) \times n = 60, n(8 + 2) = 60,$
or $(8 + 2)n = 60.$
4. $2n + 8 = 20$

EQUATIONS

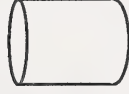
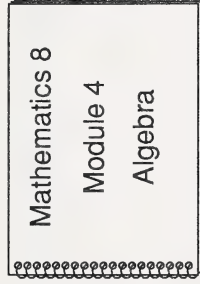
What Lies Ahead

In this section the student will learn these skills.

- modelling equations
- solving equations by inspection or by using guess-check-revise methods
- verifying solutions by modelling the equation

Gathering Materials

For this section the student will need these items.



*MATH MOVES: Equations — Solving
With One Step (ACCESS)*

(optional)

Guiding the Student

- Emphasize to the students the goal of this section.
- Help the students decide what to do in this section.

- Help the students check their answers to the activities in this section and correct any errors.

Introductory Activities

1. a. Model $a + 4 = 5$.
 b. Solve the equation by inspection. (Find the value that makes the equation true.)
 c. Verify the solution. (Check to see if the equation is true for this value of the variable.)
2. a. Model $b - 2 = -5$.
 b. Solve the equation by inspection.
 c. Verify the solution.
3. a. Model $2c = -6$.
 b. Solve the equation by inspection.
 c. Verify the solution.
4. a. Model $3d = 9$.
 b. Solve the equation by inspection.
 c. Verify the solution.

Suggested Activities

Modelling and verifying is shown on pages 53 to 55.

1. b. By inspection you can see that $a = 1$.
2. b. By inspection you can see that $b = -3$.
3. b. By inspection you can see that $c = -3$.
4. b. By inspection you can see that $d = 3$.

5. a. Model $2m + 1 = 7$.
b. Solve the equation by inspection.
c. Verify the solution.
6. a. Model $3x - 1 = 2$.
b. Solve the equation by inspection.
c. Verify the solution.
7. a. Model $3x - 8 = 16$.
b. Solve the equation by using the guess-check-revise method.
c. Verify the solution.
8. a. Model $4x = 2x + 6$.
b. Solve the equation by using the guess-check-revise method.
c. Verify the solution.
5. b. By inspection you can see that $m = +3$.
6. b. By inspection you can see that $x = +1$.
7. b. By using the guess-check-revise method, you will find that $x = 8$.
8. b. By using the guess-check-revise method, you will find that $x = 3$.

9. a. Model $8 + 3x = 7x$.
b. Solve the equation by using the guess-check- revise method.
c. Verify the solution.
10. a. Model $4(n + 3) = 20$.
b. Solve the equation by using the guess-check- revise method.
c. Verify the solution.
11. a. Model $2x - 3 = 2 + 3x$.
b. Solve the equation by using the guess-check- revise method.
c. Verify the solution.
9. b. By the guess-check-reverse method $x = 2$.
10. b. By the guess-check-reverse method $n = 2$.
11. b. By the guess-check-reverse method $x = -5$.

Modelling

1. a. Model $a + 4 = 5$.



- c. Verify $a = 1$.



LS = RS

2. a. Model $b - 2 = -5$.



- c. Verify $b = -3$.

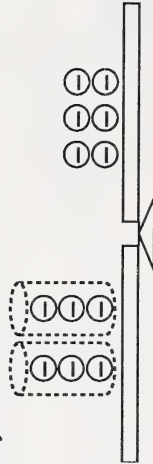


LS = RS

3. a. Model $2c = -6$.



- c. Verify $c = -3$.

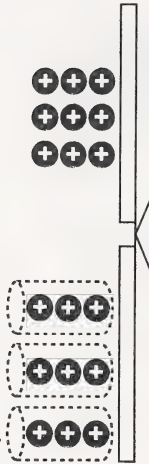


LS = RS

4. a. Model $3d = 9$.



- c. Verify $d = 3$.

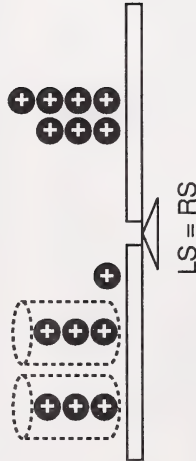


LS = RS

5. a. Model $2m + 1 = 7$.



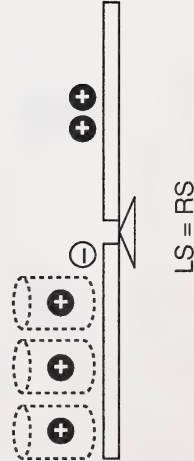
- c. Verify $m = 3$.



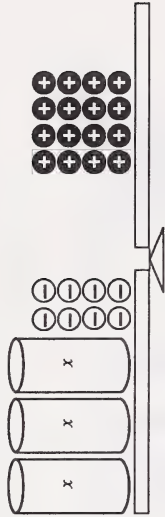
6. a. Model $3x - 1 = 2$.



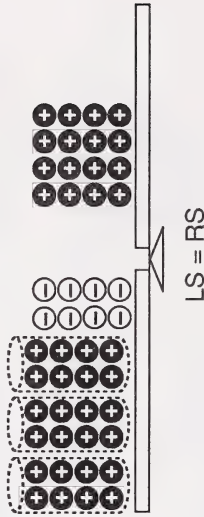
- c. Verify $x = +1$.



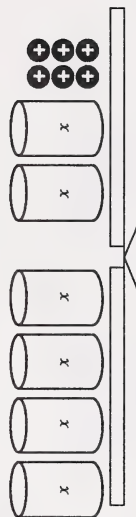
7. a. Model $3x - 8 = 16$.



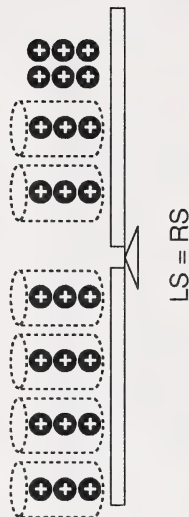
- c. Verify $x = +8$.



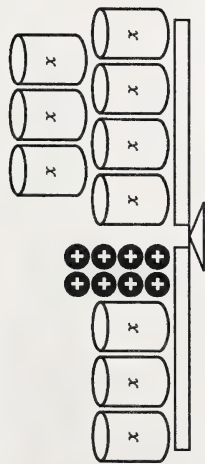
8. a. Model $4x = 2x + 6$.



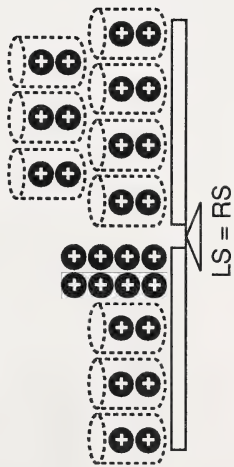
- c. Verify $x = 3$.



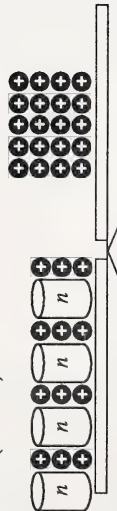
9. a. Model $8 + 3x = 7x$.



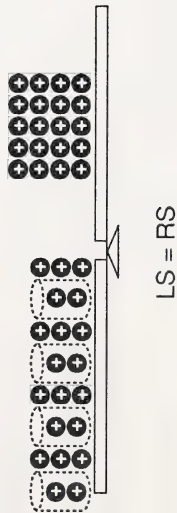
- c. Verify $x = 2$.



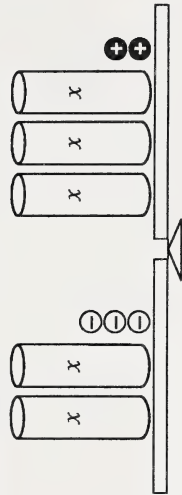
10. a. Model $4(n + 3) = 20$.



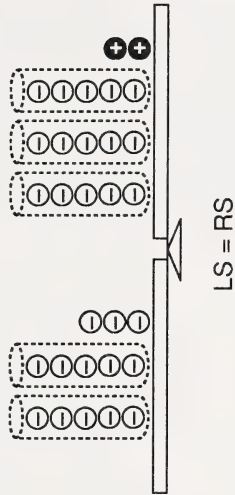
- c. Verify $n = 2$.



11. a. Model $2x - 3 = 2 + 3x$.



- c. Verify $x = -5$.



Practice Activities

Solve the following equations by using inspection or guess-check-revise methods. Do not use models.

1. $n + 8 = 12$

2. $p - 5 = -5$

3. $4b = -4$

4. $6 + x = 3$

5. $3w + 8 = 5$

6. $4t - 1 = 7$

7. $5x + 4 = 4x + 10$

8. $2(a - 7) = 4$

Suggested Answers

1. $n = 4$

2. $p = 0$

3. $b = -1$

4. $x = -3$

5. $w = -1$

6. $t = 2$

7. $x = 6$

8. $a = 9$

Concluding Activities

Solve the following equations by using inspection or guess-check-revise methods. Do not use models.

1. $\frac{a}{3} = 5$

2. $\frac{b}{4} = 20$

3. $\frac{30}{c} = 6$

4. $\frac{r}{15} = \frac{1}{5}$

5. $\frac{10}{t} = \frac{2}{3}$

Suggested Answers

1. $a = 15$

2. $b = 80$

3. $c = 5$

4. $r = 3$

5. $t = 15$

SOLVING EQUATIONS USING ADDITIVE INVERSES

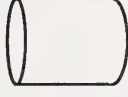
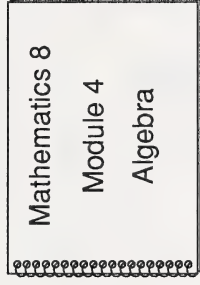
What Lies Ahead

In this section the student will learn these skills.

- using learning aids and additive inverses to solve equations
- using a paper and pencil method and additive inverses to solve equations

Gathering Materials

For this section the student will need these items.



*MATH MOVES: Equations — Solving
With One Step (ACCESS)*

(optional)

Guiding the Student

- Emphasize to the students the goal of this section.
- Help the students decide what to do in this section.
- Help the students to check their answers to the activities in this section and correct any errors.

Introductory Activities

Model these equations and solve the equations by isolating the variable. Be sure to verify your solutions.

1. $n + 7 = 9$

2. $b - 2 = 6$

3. $y - 1 = 1$

4. $q - 4 = -7$

5. $7 = m - 5$

Suggested Answers

Modelling and verifying is shown on the next page.

1. $n = +2$

2. $b = +8$

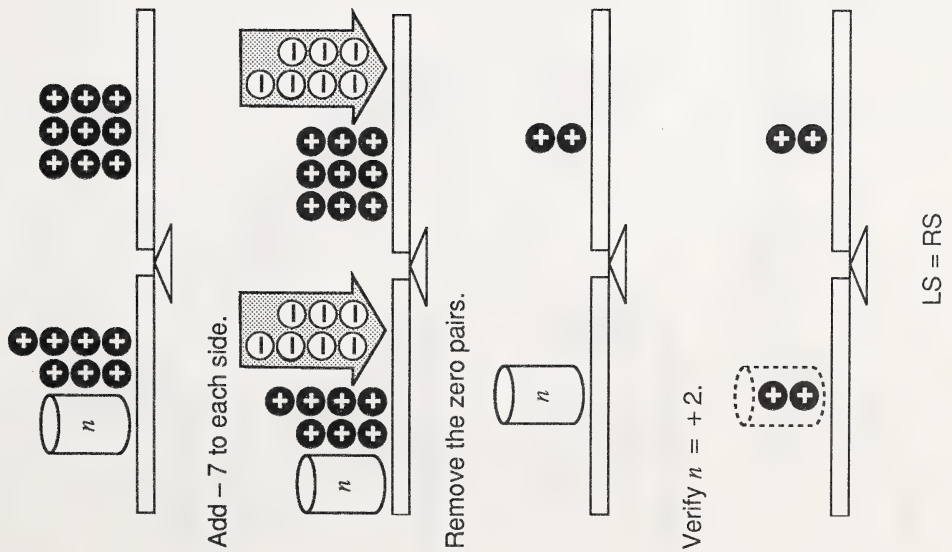
3. $y = +2$

4. $q = -3$

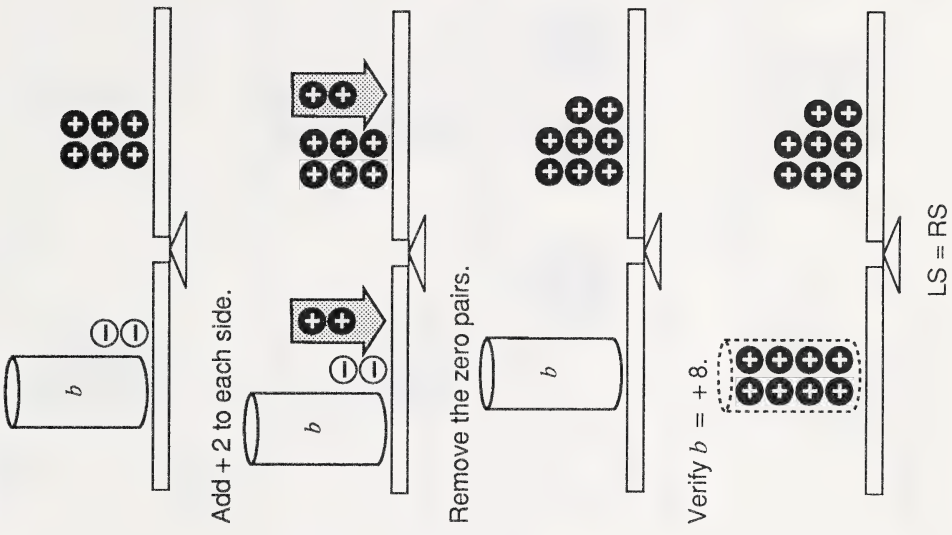
5. $m = +12$

Modelling

1. Model $n + 7 = 9$.



2. Model $b - 2 = 6$.



3. Model $y - 1 = 1$.



Add +1 to each side.



Remove the zero pairs.

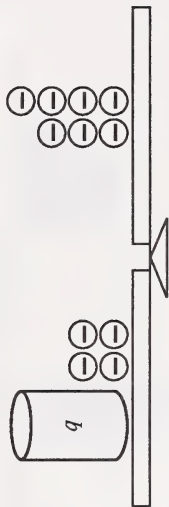


Verify $y = +2$.

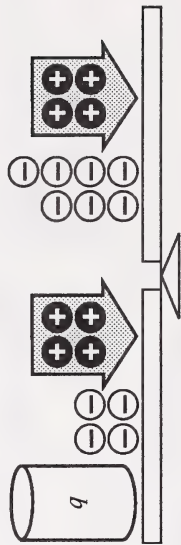


LS = RS

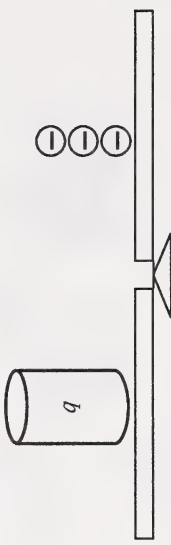
4. Model $q - 4 = -7$.



Add +4 to each side.



Remove the zero pairs.

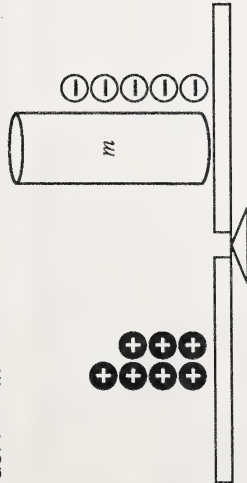


Verify $q = -3$.

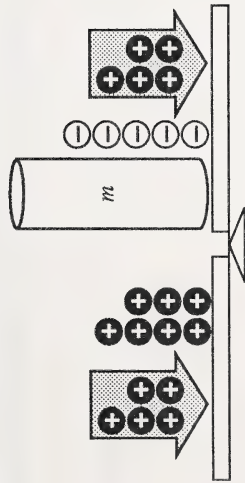


LS = RS

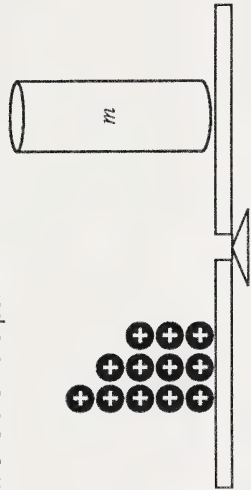
5. Model $7 = m - 5$.



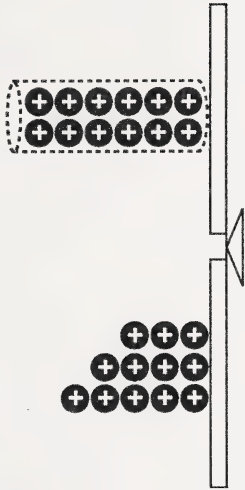
Add + 5 to each side.



Remove the zero pairs.



Verify $m = 12$.



LS = RS

Practice Activities

1. What numbers should be added to both sides to isolate the variable?

a. $x + 2 = 7$

b. $s + 4 = 9$

c. $m + 9 = -13$

d. $t - 5 = 7$

e. $y - 2 = -8$

2. Solve the equations in Question 1 using paper and pencil methods. Verify your solutions.

Suggested Answers

1. a. -2

b. -4

c. -9

d. $+5$

e. $+2$

2. a. $x = 5$

b. $s = 5$

c. $m = 4$

d. $t = 12$

e. $y = -6$

Extra Practice

Use flow charts and inverse flow charts to solve these equations.

1. $s - 3 = 5$

2. $k + 12 = 39$

3. $2 + m = 8$

4. $s - 4 = 3$

Suggested Answers

1. $s = 8$

2. $k = 27$

3. $m = 6$

4. $s = 7$

Concluding Activities

Solve these equations using a paper and pencil method. Verify your solutions.

1. $x + 225 = 5$

2. $n - 8.5 = 12.3$

3. $q - \frac{1}{2} = \frac{3}{4}$

4. $p + 7.5 = 8.2$

5. $m - 5\frac{3}{4} = 3\frac{1}{4}$

6. $s - 383 = 117$

Suggested Answers

1. $x = -220$

2. $n = 20.8$

3. $q = 1\frac{1}{4}$

4. $p = 0.7$

5. $m = 9$

6. $s = 500$

SOLVING EQUATIONS USING MULTIPLICATIVE INVERSES

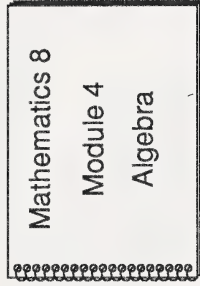
What Lies Ahead

In this section the student will learn these skills.

- using learning aids and multiplicative inverses to solve equations
- using paper and pencil methods and multiplicative inverses to solve equations

Gathering Materials

For this section the student will need these items.



*MATH MOVES: Equations—Solving
With One Step (ACCESS)*

(optional)

Guiding the Student

- Emphasize to the students the goal of this section.
- Help the students decide what to do in this section.

- Help the students to check their answers to the activities in this section and correct any errors.

Introductory Activities

Model these equations and solve the equations by isolating the variable. Be sure to verify your solutions.

1. $2y = 6$

2. $2x = 6$

3. $2t = -2$

4. $3w = 12$

5. $10 = 5t$

Suggested Answers

Modelling is shown on the next page.

1. $y = 3$

2. $x = 3$

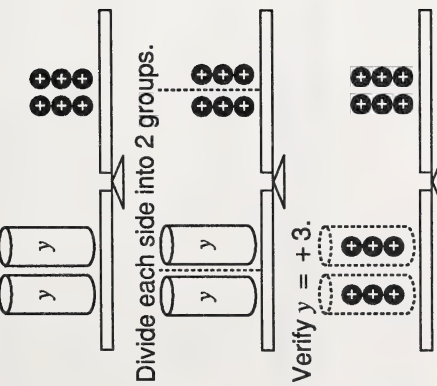
3. $t = -1$

4. $w = 4$

5. $t = 2$

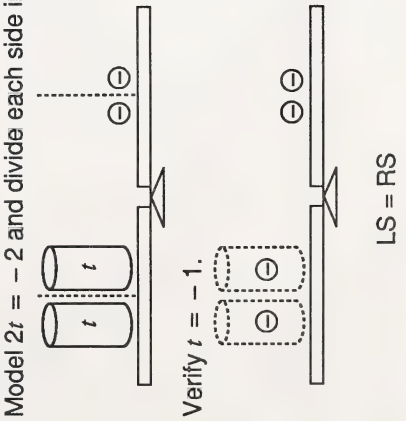
Modelling

1. Model $2y = 6$.

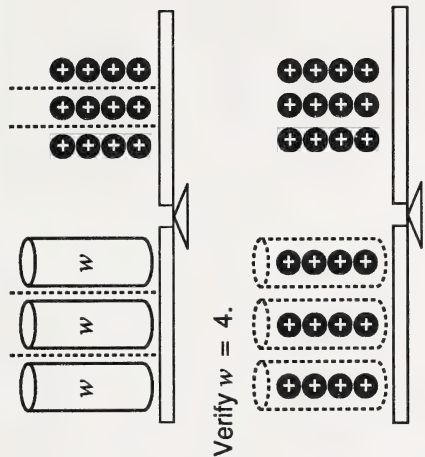


2. Model $2x = 6$ the same way as you did $2y = 6$ in Question 1.

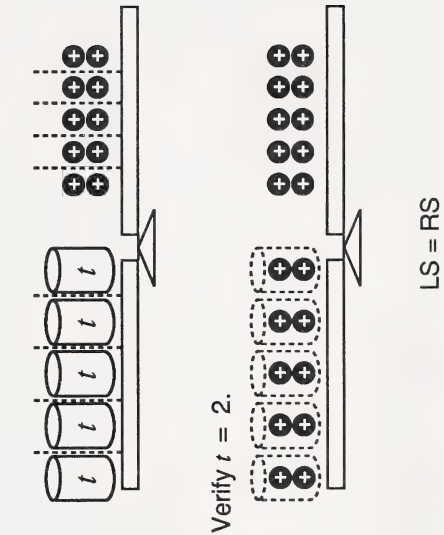
3. Model $2t = -2$ and divide each side into 2 groups.



4. Model $3w = 12$ and divide each side into 3 groups.



5. Model $10 = 5t$ and divide each side into 5 groups.



Practice Activities

1. What number should both sides be divided by to isolate the variable?

a. $2y = 18$

b. $4v = 32$

c. $3m = -9$

d. $-2f = -4$

e. $5y = -10$

2. Solve the equations in Question 1 by using paper and pencil methods. Verify your solutions.

Suggested Answers

1. a. 2

b. 4

c. 3

d. -2

e. 5

2. a. $y = 9$

b. $v = 8$

c. $m = -3$

d. $f = 2$

e. $y = -2$

Extra Practice

Use flow charts and inverse flow charts to solve these equations.

1. $9t = -72$

2. $3t = 30$

3. $44 = 4n$

4. $-10 = 2w$

Suggested Answers

1. $t = -8$

2. $t = 10$

3. $n = 11$

4. $w = -5$

Concluding Activities

Solve the equations using a paper and pencil method. Verify the solutions.

1. $4t = 6$

2. $3a = \frac{1}{2}$

3. $2r = \frac{3}{4}$

4. $2p = 14.4$

5. $3m = 0.9$

Suggested Answers

1. $t = 1\frac{1}{2}$

2. $a = \frac{1}{6}$

3. $r = \frac{3}{8}$

4. $p = 7.2$

5. $m = 0.3$

SOLVING MORE EQUATIONS USING MULTIPLICATIVE INVERSES

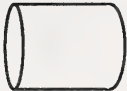
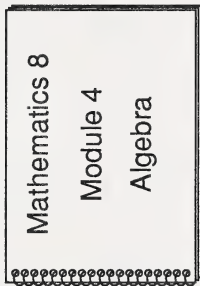
What Lies Ahead

In this section the student will learn these skills.

- using learning aids and multiplicative inverses to solve more equations
- using paper and pencil methods and multiplicative inverses to solve more equations
- using clearing-denominator methods and cross-product methods to solve equations

Gathering Materials

For this section the student will need these items.



Guiding the Student

- Emphasize to the students the goal of this section.
- Help the students decide what to do in this section.
- Help the students to check their answers to the activities in this section and correct any errors.

Introductory Activities

1. Solve the following equations by using models. Be sure to verify each solution.

a. $\frac{n}{5} = 6$

b. $\frac{q}{11} = 3$

c. $\frac{r}{2} = -12$

d. $\frac{p}{8} = 2$

e. $\frac{b}{7} = -1$

2. Solve the equations in Question 1 using paper and pencil methods.

Suggested Answers

1. Modelling and verifying is shown on the next page.

a. $n = 30$

b. $q = 33$

c. $r = -24$

d. $p = 16$

e. $b = -7$

2. The answers will be the same as those found in Question 1.

Modelling

- a. Model $\frac{n}{5} = 6$.



Multiply each side by 5, and replace five $\frac{n}{5}$ with n .



Verify $n = 30$ and $\frac{n}{5} = 6$.



LS = RS

- b. Model $\frac{q}{11} = 3$.



Multiply each side by 11.

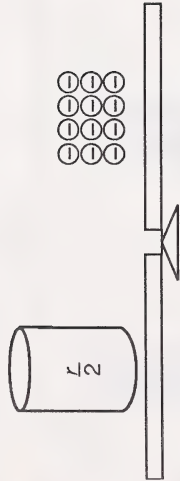


Verify $q = 33$ and $\frac{q}{11} = 3$.

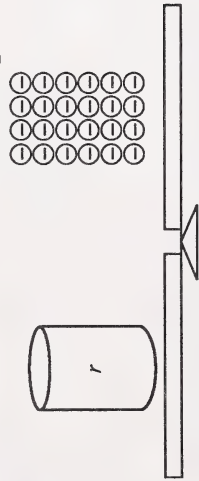


LS = RS

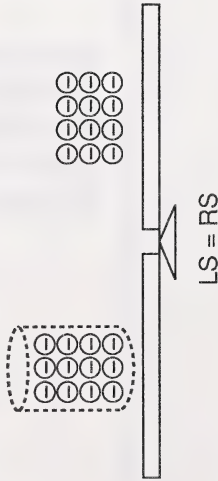
- c. Model $\frac{r}{2} = -12$.



Multiply each side by 2, and replace two $\frac{r}{2}$ with r .



Verify $r = -24$ and $\frac{r}{2} = -12$.



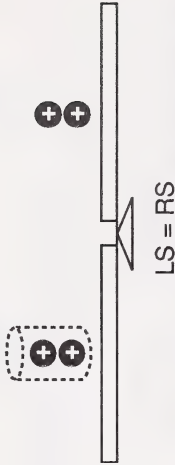
- d. Model $\frac{p}{8} = 2$.



Multiply each side by 8, and replace eight $\frac{p}{8}$ by p .



Verify $p = 16$ and $\frac{p}{8} = 2$.



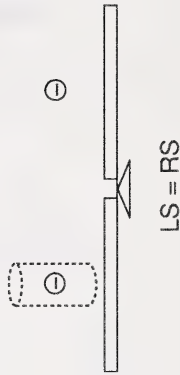
- e. Model $\frac{b}{7} = -1$.



Multiply each side by 7, and replace seven $\frac{b}{7}$ with b .



Verify $b = -7$ and $\frac{b}{7} = -1$.



Practice Activities

1. What number should both sides of the equation be multiplied by to isolate the variable?

a. $\frac{n}{15} = \frac{2}{3}$

b. $\frac{f}{9} = \frac{8}{3}$

c. $\frac{y}{5} = \frac{30}{36}$

d. $\frac{z}{7} = \frac{5}{8}$

e. $\frac{3}{4} = \frac{c}{20}$

2. Solve the equations in Question 1. Verify your solutions.

Suggested Answers

1. a. 15

b. 9

c. 5

d. 7

e. 20

2. a. $n = 10$

b. $f = 24$

c. $y = 4\frac{1}{6}$

d. $r = 4\frac{3}{8}$

e. $c = 15$

Extra Practice

Use flow charts and inverse flow charts to solve these equations.

1. $\frac{a}{3} = 2$

2. $\frac{b}{4} = 16$

3. $\frac{c}{2} = \frac{3}{4}$

4. $\frac{d}{5} = \frac{8}{25}$

Suggested Answers

1. $a = 6$

2. $b = 64$

3. $c = 1\frac{1}{2}$

4. $c = 1\frac{3}{5}$

Concluding Activities

Solve the following equations by clearing the denominators or by using cross products. Be sure to verify your solutions.

1. $\frac{h}{7} = \frac{5}{2}$

2. $\frac{5}{t} = \frac{9}{8}$

3. $\frac{n}{2} = \frac{1}{4}$

4. $\frac{4}{m} = \frac{1}{3}$

5. $\frac{w}{6} = \frac{1}{3}$

Suggested Answers

1. $h = 17\frac{1}{2}$

2. $t = 4\frac{4}{9}$

3. $n = \frac{1}{2}$

4. $m = 12$

5. $w = 2$

SOLVING EQUATIONS USING ADDITIVE AND MULTIPLICATIVE INVERSES

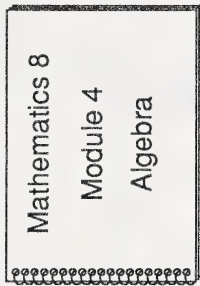
What Lies Ahead

In this section the student will learn these skills.

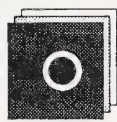
- solving more complex equations using learning aids
- solving more complex equations using a procedure with paper and pencil

Gathering Materials

For this section the student will need these items.



(optional)



(optional)

*MATH MOVES: Equations—Solving
With More Than One Step (ACCESS)*

*Computer Drill and Instruction:
Mathematics, Level D (SRA)*

Guiding the Student

- Emphasize to the students the goal of this section.
- Help the students decide what to do in this section.

- Help the students to check their answers to the activities in this section and correct any errors.

Introductory Activities

Model these equations by isolating the variable. Be sure to verify your solutions.

1. $3q - 3 = 6$

2. $3y + 4 = 13$

3. $2b + 6 = 12$

4. $p + 3p = 8$

5. $5k - 2k = 6$

Suggested Answers

Modelling is shown on the next page.

1. $q = +3$

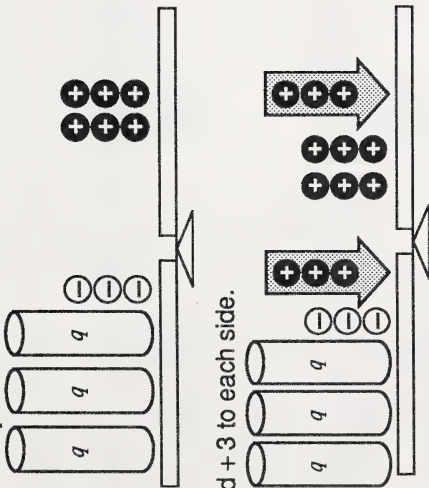
2. $y = +3$

3. $b = +3$

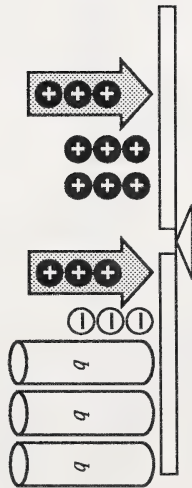
4. $p = +2$

5. $k = +2$

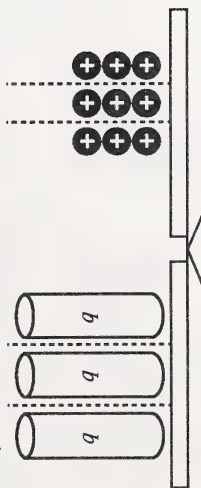
1. Model $3q - 3 = 6$.



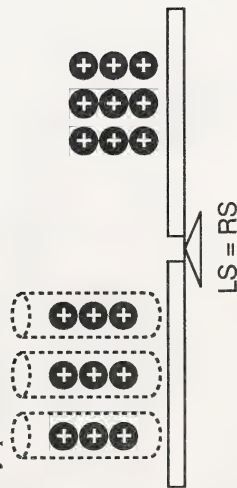
Add +3 to each side.



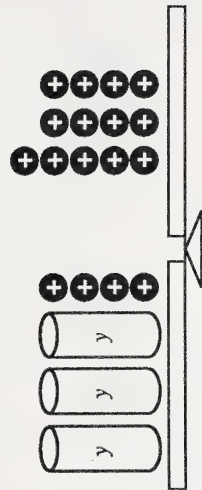
Remove the zero pairs and then divide each side into 3 groups.



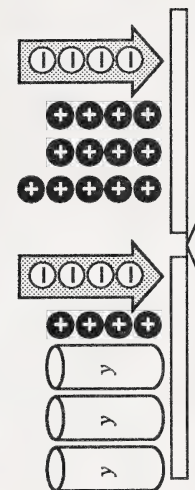
Verify $q = +3$.



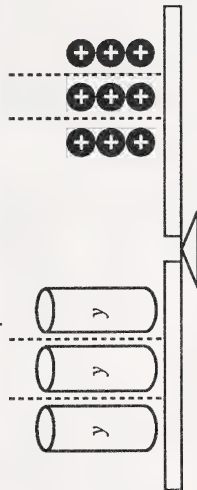
2. Model $3y + 4 = 13$.



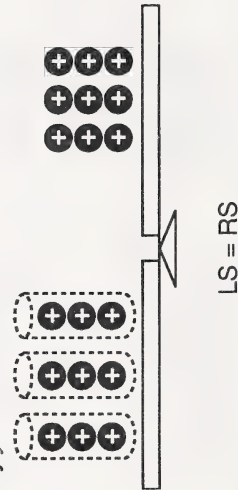
Add -4 to each side.



Remove the zero pairs and divide each side into 3 groups.



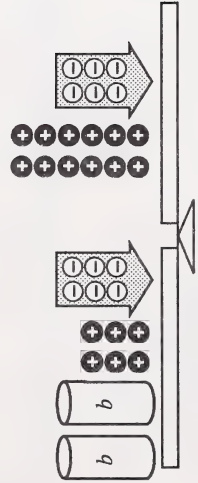
Verify $y = +3$.



3. Model $2b + 6 = 12$.



Add -6 to each side.



Remove the zero pairs and divide each side into 2 groups.

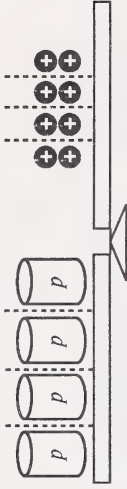


Verify $b = +3$.



LS = RS

4. Model $p + 3p = 8$ and divide each side into 4 groups.



Verify $p = +2$.



LS = RS

5. Model $5k - 2k = 6$.



Remove the zero pairs and divide each side into 3 groups.



Verify $k = +2$ and $-k = -2$.

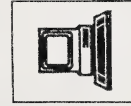


LS = RS

Practice Activities

Suggested Answers

Computer Alternative



1. Do Lesson 8 and Lesson 10 on the disk *Pre-Algebra* from the package *Computer Drill and Instruction: Mathematics, Level D* (SRA).

1. Computer corrected

Print Alternative

2. Solve the equations by using a paper and pencil method. Be sure to verify your solutions.



- | | |
|-------------------|-------------|
| a. $5x + 6 = 31$ | a. $x = 5$ |
| b. $6x - 3 = 15$ | b. $x = 3$ |
| c. $8a + 6 = 22$ | c. $a = 2$ |
| d. $3c - 3 = -24$ | d. $c = -7$ |
| e. $11n + 44 = 0$ | e. $n = -4$ |

3. Solve the following conditions. Place the letter that goes with each condition below the solution in the boxes below.

A $8y - 5y = 30$

L $4a + 2a + 3a = 18$

V $3x + 5x - 2x = 36$

T $9b - 4b + 2b = 77$

E $10c + 4c - 6c = 64$

H $4m + 3m = 84$

O $8x + 2x - 2 = 28$

I $12y - 11y = 8 - 3$

M $-10a + 5a + 7 - 5 = -33$

5	4	2	3	6	8	9	7	10	11	12
I		L	O	V	E		M	A	T	H

3. $y = 10$

$a = 2$

$x = 6$

$b = 11$

$c = 8$

$m = 12$

$x = 3$

$y = 5$

$a = 7$

Extra Practice

Solve the following equations using flow charts and inverse flow charts. Use your calculator to help you if you wish.

1. $3a - 2 = 7$

2. $2b + 1 = -9$

3. $3c - 4 = 5$

4. $4b - 1 = -9$

5. $2d + 1 = 5$

Suggested Answers

1. $a = 3$

2. $b = -5$

3. $c = 3$

4. $b = -2$

5. $d = 2$

Concluding Activities

Solve the following equations by using additive and multiplicative inverses. Verify the solutions.

1. $2a + \frac{1}{2} = \frac{3}{4}$

2. $3b - 1 = 8.3$

3. $5c + 1.5 = -10$

4. $2.5 = 1 + 3d$

5. $t + 1 + 3t = 9$

Suggested Answers

1. $a = \frac{1}{8}$

2. $b = 3.1$

3. $c = 2.3$

4. $d = 0.5$

5. $t = 2$

EQUATIONS WITH TWO VARIABLES

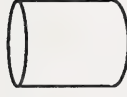
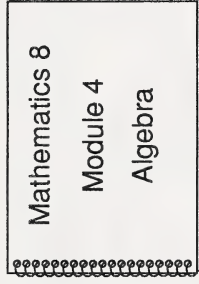
What Lies Ahead

In this section the student will learn these skills.

- modelling equations with two variables
- making a table of values for equations with two variables
- graphing equations

Gathering Materials

For this section the student will need these items.



Guiding the Student

- Emphasize to the students the goal of this section.
- Help the students decide what to do in this section.
- Help the students check their answers to the activities in this section and correct any errors.

Introductory Activities

For each of the equations do the following.

- Use inspection or guess-check-revise methods to find three solutions.
- Write the solutions as ordered pairs.
- Verify the solutions with models.

1. $y = 3x$

2. $y = x - 1$

3. $y = 2x + 1$

Suggested Answers

Models are shown on the next page.

1. $(0, 0), (1, 3), (2, 6), (3, 9), (4, 12), \dots$

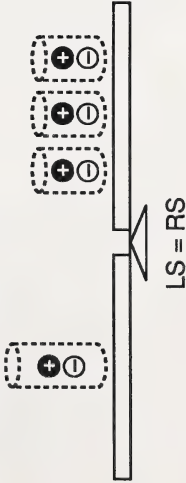
2. $(0, -1), (1, 0), (2, 1), (3, 2), (4, 3), \dots$

3. $(0, 1), (1, 3), (2, 5), (3, 7), (4, 9), \dots$

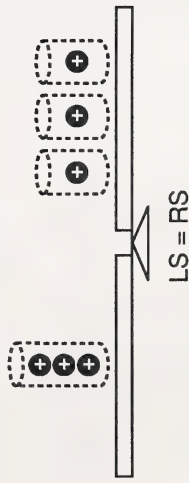
1. Model $y = 3x$.



Verify that the solution is $(0, 0)$.



Verify that the solution is $(1, 3)$.

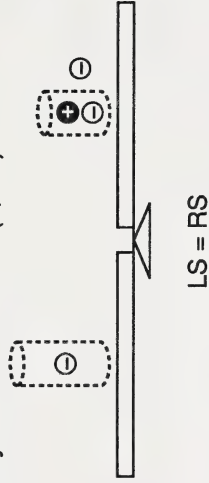


The other ordered pairs are verified in a similar manner.

2. Model $y = x - 1$.



Verify that the solution is $(0, -1)$.

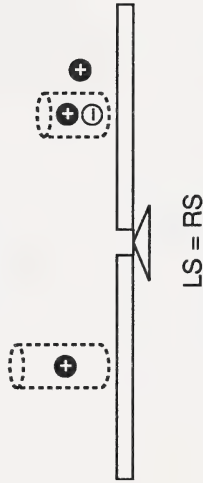


The other ordered pairs are verified in a similar manner.

3. Model $y = 2x + 1$.



Verify that the solution is $(0, 1)$.



The other ordered pairs are verified in a similar manner.

Practice Activities

1. Complete the following tables of values.

a.

$y = 2x$	
x	y
-3	
0	
3	
6	

a.

$y = 2x$	
x	y
-3	-6
0	0
3	6
6	12

b.

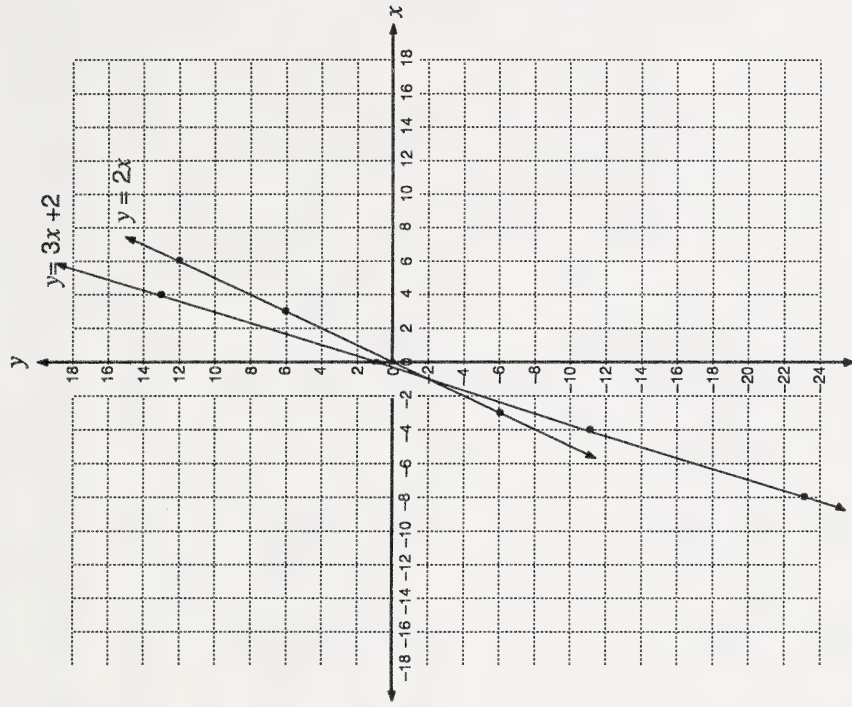
$y = 3x + 1$	
x	y
-8	
-4	
0	
4	

b.

$y = 3x + 1$	
x	y
-8	-23
-4	-11
0	1
4	13

Suggested Answers

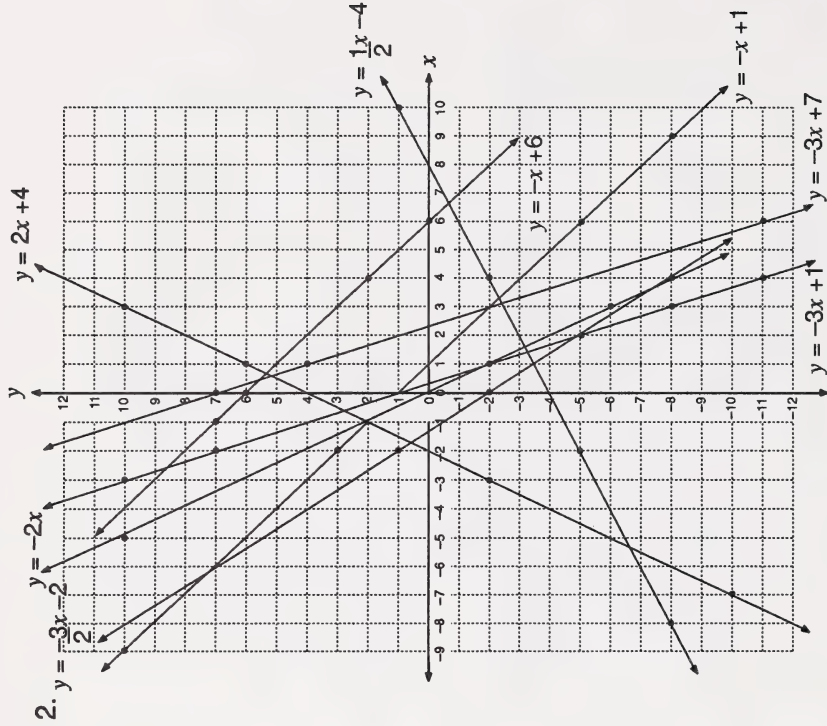
2. Graph the equations from Question 1.



Concluding Activities

1. Find the answer to the riddle by completing the worksheet on the following page.¹
2. Graph each of the equations from Question 1 on the grid at the right.
3. What do you notice about the graphs of all the equations in Question 1?

Suggested Answers



3. All the graphs are of straight lines. The graphs of equations with positive coefficients slant from top right to bottom left. The graphs of equations with negative coefficients slant from top left to bottom right.

¹1982 Creative Publications, Sunnyvale, California 94086 for excerpt from *Algebra With Pizzazz*.

WHY DID ZORNA POUR KETCHUP ON HER BROTHER'S HAND?

Complete the table for each equation. Find each answer in the code key and notice the letter next to it. Write this letter in the box at the bottom of the page that contains the circled number in that row of the table.

$y = -2x$	
x	y
1	-2 1
4	-8 2
-5	10 3
3	-6 4

$y = 2x + 4$	
x	y
3	10 5
-7	-10 6
1	6 7
-3	-2 8

$y = -3x + 1$	
x	y
3	-8 9
-3	10 10
4	-11 11
-2	7 12

$y = \frac{1}{2}x - 4$	
x	y
10	1 13
-2	-5 14
4	-2 15
-8	-8 16

$y = -x + 6$	
x	y
4	2 17
-1	7 18
6	0 19
0	6 20

$y = -\frac{3}{2}x - 2$	
x	y
4	-8 21
2	-5 22
0	-2 23
-2	1 24

$y = -3x + 7$	
x	y
6	-11 25
1	4 26
0	7 27
-2	13 28

$y = -x + 1$	
x	y
-2	3 29
-9	10 30
9	-8 31
6	-5 32

CODE KEY	
13	L
10	R
7	A
6	T
4	P
3	M
2	W
1	I
0	N
-2	H
-5	D
-6	B
-8	E
-10	O
-11	S

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
H	E	R	B	R	O	T	H	E	R	S	A	I	D	H	E	W	A	N	T	E	D	H	I	S	P	A	L	M	R	E	D

RELATIONS

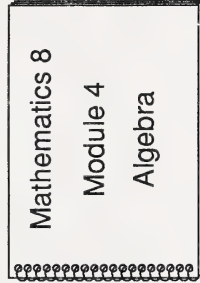
What Lies Ahead

In this section the student will learn these skills.

- describing a relation using a table, a rule, ordered pairs, and a graph
- finding missing terms in a sequence

Gathering Materials

For this section the student will need these items.



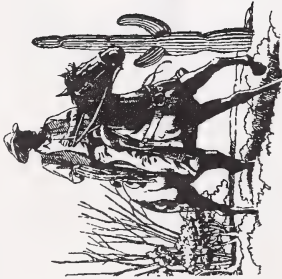
Guiding the Student

- Emphasize to the students the goal of this section.
- Help the students decide what to do in this section.
- Help the students check their answers to the activities in this section and correct any errors.

Practice Activities

Suggested Answers

1. Santini likes to go horseback riding. How is the cost related to the riding time?



Riding Time in Hours (t)	Relation	Cost in Dollars (c)
1	$4 + 2 \times 1$	6
2	$4 + 2 \times 2$	8
3	$4 + 2 \times 3$	10
4	$4 + 2 \times 4$	12
5	$4 + 2 \times 5$	14

Describe the relationship by using each of the following methods.

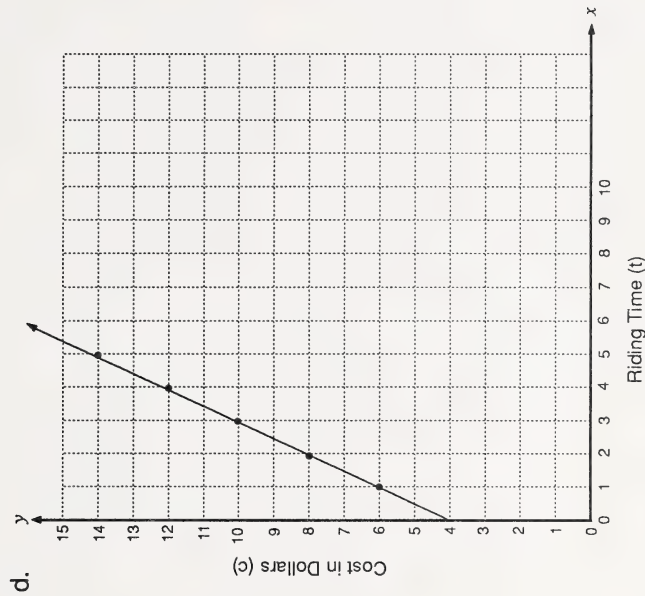
- a. Write the words to describe the relation.
b. Write an equation to describe the relation.

1. a. Two times the riding time plus four equals the cost.
b. $c = 4 + 2t$

- c. Write ordered pairs to describe the relation.

c. $(1, 6), (2, 8), (3, 10), (4, 12), (5, 14), \dots$

- d. Describe the relationship using a graph.



2. How is Rajah's hourly pay related to Nadia's hourly pay?



Nadia's Pay (f)	Relation	Rajah's Pay (g)
5	$5 - 1$	4
6	$6 - 1$	5
7	$7 - 1$	6
8	$8 - 1$	7
9	$9 - 1$	8

Describe the relationship several ways by using each of the following methods.

- a. Write words to describe the relation.
- b. Write an equation to describe the relation.

2. a. Nadia's pay minus one dollar is equal to Rajah's pay.

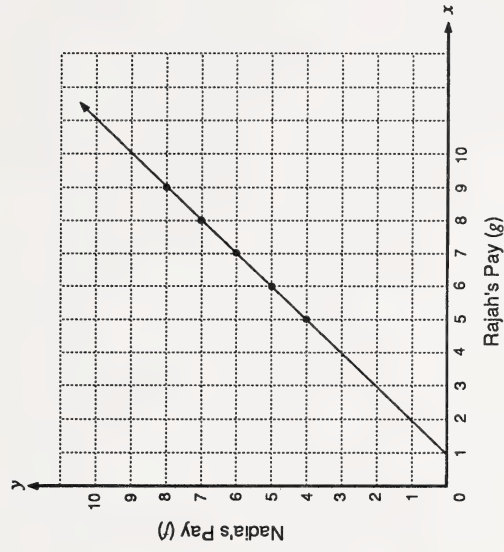
b. $g = f - 1$

- c. Write ordered pairs to describe the relation.

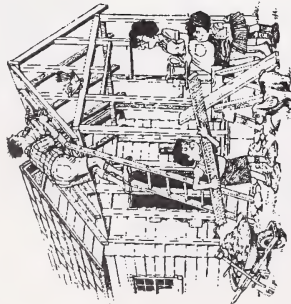
c. $(5, 4), (6, 5), (7, 6), (8, 7), (9, 8), \dots$

- d. Use a graph to describe the relation.

d.



3. How is the length (in metres) of the new room related to the width (in metres) of the new room?



Width in Metres (w)	Relation	Length in Metres (ℓ)
1	$2 \times 1 + 3$	5
2	$2 \times 2 + 3$	7
3	$2 \times 3 + 3$	9
4	$2 \times 4 + 3$	11
5	$2 \times 5 + 3$	13

Describe the relationship by using each of the following methods.

- a. Describe the relation using words.
- b. Describe the relation using an equation.

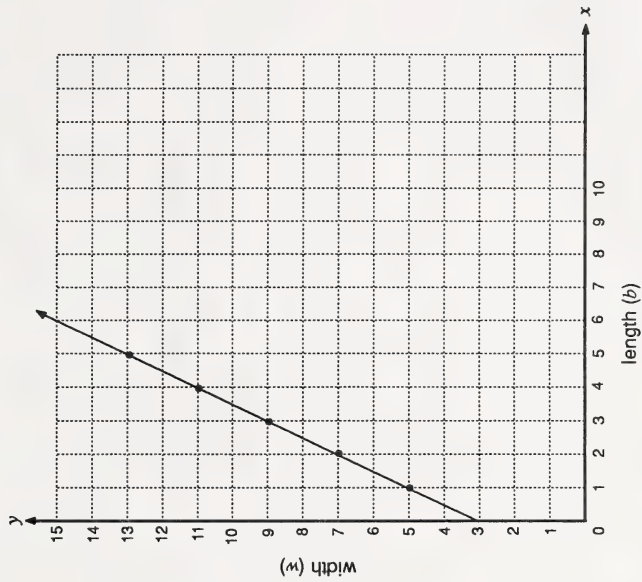
- 3. a. Two times the width plus three metres equals the length.
- b. $\ell = 2w + 3$

c. Describe the relation using ordered pairs.

c. $(1, 5), (2, 7), (3, 9), (4, 11), (5, 13), \dots$

d. Describe the relation using a graph.

d.



Concluding Activities

1. a. What are the next three terms of the following sequence?
 $5, 6, 7, 8, \begin{smallmatrix} \blacksquare & \blacksquare & \blacksquare \\ \blacksquare & \blacksquare & \blacksquare \end{smallmatrix}, \begin{smallmatrix} \blacksquare & \blacksquare & \blacksquare \\ \blacksquare & \blacksquare & \blacksquare \end{smallmatrix}$
- b. Find the fiftieth term of the above sequence.

Suggested Answers

1. a. $\dots, 9, 10, 11$
- b.

Term	Relation	Number
1	$1 + 4$	5
2	$2 + 4$	6
3	$3 + 4$	7
4	$4 + 4$	8

The relation is $n + 4$.

Evaluate $n + 4$ if $n = 50$.

$$50 + 4 = 54$$

The fiftieth term is 54.

2. a. What are the next three terms of the following sequence?
 $6, 9, 12, 15, \begin{smallmatrix} \blacksquare & \blacksquare & \blacksquare \\ \blacksquare & \blacksquare & \blacksquare \end{smallmatrix}, \begin{smallmatrix} \blacksquare & \blacksquare & \blacksquare \\ \blacksquare & \blacksquare & \blacksquare \end{smallmatrix}$
- b. Find the fiftieth term of the above sequence.

Term	Relation	Number
1	$(1 + 1) \times 3$	6
2	$(2 + 1) \times 3$	9
3	$(3 + 1) \times 3$	12
4	$(4 + 1) \times 3$	15




The relation is $(n + 1) \times 3$.

Evaluate $(n + 1) \times 3$ if $n = 50$.

$$(50 + 1) \times 3 = 153$$

The fiftieth term is 153.

3. a. What are the next three terms of the following sequence?

8, 16, 24, 32, 40, , , 

- b. Find the fiftieth term of the above sequence.

3. a. ..., 48, 56, 64

- b.

Term	Relation	Number
1	1×8	8
2	2×8	16
3	3×8	24
4	4×8	32
5	5×8	40

The relation
is $n \times 8$.

Evaluate $n \times 8$ if $n = 50$.

$$50 \times 8 = 400$$

The fiftieth term is 400.

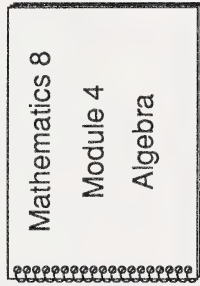
SUMMARY

What Lies Ahead

In this section the student will review the skills learned in Module 4.

Gathering Materials

For this section the student will need these items.



Guiding the Student

- Emphasize to the students the goal of this section.
- Help the students check their answers to the pretest in Section 1.

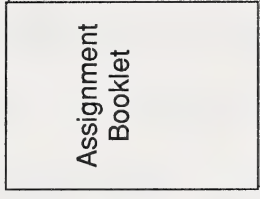
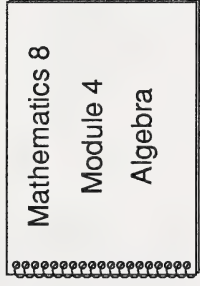
MODULE CONCLUSION

What Lies Ahead

In this section the student will complete the module assignment.

Gathering Materials

For this section the student will need these items.



Guiding the Student

- Emphasize to the students the goal of this section is to assess what the student has learned.
- Give each student a grade and feedback to the assignments.

Suggested Answers to Assignment Booklet**Part 1: Multiple-Choice Questions**

40

Each of the following questions has four suggested answers, one of which is better than the others. Place the letter of the best answer in the blank on the response page at the right.

1. Which phrase is represented by $2n - 3$?
 - A. two times, a number minus three
 - B. three less than one-half of a number
 - C. two times a number, minus three
 - D. three less than two, times a number
2. Which phrase is represented by $2(n + 3)$?
 - A. three more than, a number multiplied by two
 - B. the product of two and a number, increased by three
 - C. three more than a number, increased by two
 - D. the product of two, and a number increased by three
3. Which phrase does **not** mean $3c^2 - 5$?
 - A. five less than, three times the square of a number
 - B. the square of 3 times a number, decreased by five
 - C. five less than, triple the square of a number
 - D. three times the square of a number, diminished by five
4. Which number is the value of $18t$ if $t = 3$?
 - A. 6
 - B. 15
 - C. 54
 - D. 183
5. Which number is the value of $3x - 2$ if $x = 4$?
 - A. 5
 - B. 6
 - C. 10
 - D. 32

Part 1 Response Page1. C 2. D 3. B 4. C 5. C

Part 1 (continued)

6. If $s = 2$ and $t = 3$, which number is the value of $3s - 8t$?
- A. -51
 - B. -5
 - C. -18
 - D. -30
7. If you simplify $5a + 4b - 2a + 3b$, which expression do you have?
- A. $9a - b$
 - B. $3a + 7b$
 - C. $3a - 7b$
 - D. $7a - b$
8. Which expression **cannot** be simplified further?
- A. $5x + 3y + x - y$
 - B. $7x - 3z + 4x - 6$
 - C. $6x + y + z - 1$
 - D. $5x + 2y + 7 - 2$
9. Which equation represents “twelve less than a number is seven”?
- A. $b - 12 = 7$
 - B. $12 = b - 7$
 - C. $12 - 7 = b$
 - D. $12 - b = 7$
10. Which equation represents “a number increased by three is seven”?
- A. $3 + 7 = n$
 - B. $3n = 7$
 - C. $3 + n = 7$
 - D. $n = 3 \times 7$

Part 1 Response Page (continued)6. C 7. B 8. C 9. B 10. C

Part 1 (continued)

11. Which equation has the solution $m = 2$?

A. $5m - 2 = 5$

B. $5m - 1 = 9$

C. $\frac{m}{5} - 4 = 3$

D. $4m - 9 = 1$

12. Which equation does not have the solution $p = 3$?

A. $2p - 5 = 1$

B. $7p + \frac{1}{2} = \frac{43}{2}$

C. $2p + 5 = 1$

D. $\frac{p}{3} - 1 = 0$

13. In solving the equation $n + 5 = 17$ using paper and pencil methods, which step is correct?

A. Add 5 to each side of the equation.

B. Add -5 to each side of the equation.

C. Multiply each side of the equation by 5.

D. Multiply each side of the equation by $\frac{1}{5}$.

14. In solving the equation $3a = 9$ using paper and pencil methods, which step is correct?

A. Add 3 to each side of the equation.

B. Add -3 to each side of the equation.

C. Multiply each side of the equation by 3.

D. Multiply each side of the equation by $\frac{1}{3}$.

Part 1 Response Page (continued)11. B 12. C 13. B 14. D

Part 1 (continued)

15. Which equation can be solved using these operations on each side? Add 5; then multiply by $\frac{1}{3}$.

- A. $3(n - 5) = 6$
- B. $3n - 5 = 31$
- C. $3n + 5n = 24$
- D. $3n + 5 = 17$

16. Which equation has the correct solution given?

- A. $\frac{n}{3} = 5, n = 7\frac{1}{2}$
- B. $\frac{a}{2} = \frac{9}{5}, a = 7$
- C. $5s + 2s = 42, s = 7$
- D. $\frac{5}{c} = \frac{2}{3}, c = 7\frac{1}{2}$

17. Which order pair is **not** a solution to the equation $m = 2n$?

- A. (1, 2)
- B. (4, 9)
- C. (3, 6)
- D. (5, 10)

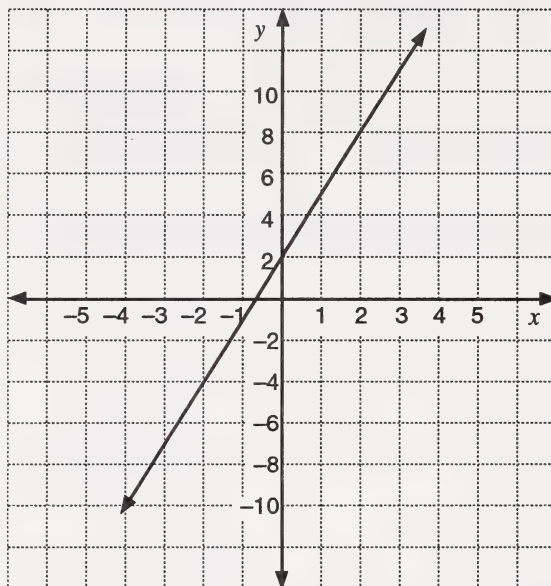
18. Which ordered pair comes next in this sequence?
(0, -1), (1, 1), (2, 3), (3, 5), ...

- A. (4, 6)
- B. (4, 7)
- C. (4, 8)
- D. (4, 9)

Part 1 Response Page (continued)15. B 16. D 17. B 18. B

Part 1 (continued)

19. Which equation is shown in the graph?



- A. $y = x + 2$
- B. $y = 2x + 2$
- C. $y = 3x + 2$
- D. $y = 2x + 3$

20. Which ordered pair fits this table?

x	7	12	2	10
y	12	17	7	15

- A. $(6, 10)$
- B. $(9, 4)$
- C. $(-3, 2)$
- D. $(-1, -5)$

Part 1 Response Page (continued)19. C 20. C **Total for Part 1 = _____ (Maximum possible: 40 marks)**

Part 2: Short-Answer Questions

Give the complete answers in the spaces provided on the response page at the right.

60

6

1. Write a mathematical statement for each of the following statements.
 - a. Uzma's age seven years ago
 - b. the product of a number and seven
 - c. Mrs. Edgar's salary doubled

8

2. Evaluate each of the following.
 - a. $3m$ if $m = 8$
 - b. $2a - 1$ if $a = -5$
 - c. $b^2 - 2bc + c^2$ if $b = 3$ and $c = 4$
 - d. $3(x + y)^2$ if $x = -1$ and $y = 3$

Part 2 Response Page

1. a. $u - 7$

b. $7n$

c. $2e$

2. a. 24

b. -11

c. 1

d. 12

Part 2 (continued)

- 6
3. Write an equation to describe each of the following situations.
- a. Sixteen more than a number is twenty.
 - b. Twice a number plus triple the same number results in thirty.
 - c. Three more than twice a number results in eight.
- 8
4. Solve each of the following equations by inspection or using the guess-check-revise method.
- a. $3y = 21$
 - b. $n - 2 = -3$
 - c. $2m + 6m = 24$
 - d. $2x - 1 = 3$
- 6
5. Write an equation to describe each of the following situations.
- a. Ruth's age divided by Benjamin's age is two.
 - b. Adrienne's new hourly wage is triple her previous hourly wage, diminished by eight dollars.
 - c. The length of the yard is five metres less than twice the width.

Part 2 Response Page (continued)

3. a. $n + 16 = 20$

b. $2n + 3n = 30$

c. $2n + 3 = 8$

4. a. $y = 7$

b. $n = -1$

c. $m = 3$

d. $x = 2$

5. a. $r + b = 2$

b. $a = 3p - 8$

c. $l = 2w - 5$

Part 2 (continued)

- 6** 6. Find three solutions for $a = b + 2$. Use inspection or guess-check-revise methods.
- 10** 7. Graph the equation $y = 2x + 3$.

Part 2 Response Page (continued)

6. Answers will vary. Here are some examples.

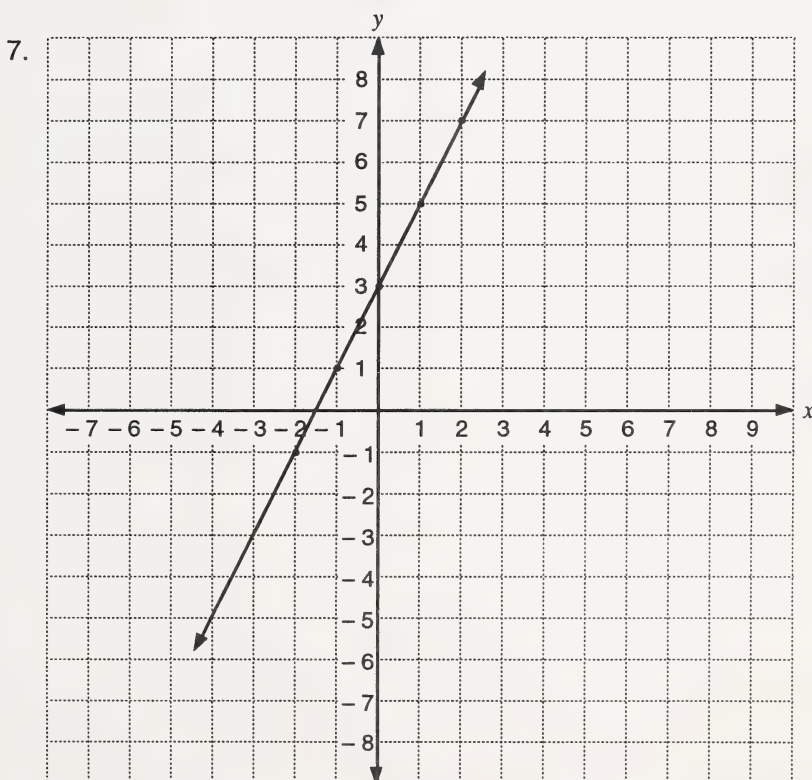
$$a = 2, b = 0$$

$$a = 3, b = 1$$

$$a = 4, b = 2$$

$$a = 5, b = 3$$

$$a = 6, b = 4$$



Total for Part 2 = _____ (Maximum possible: 60 marks)

80

20

Part 3: Problems

Give complete answers in the spaces provided on the response page at the right. Be sure to clearly show how you arrived at your answer.

1. Use paper and pencil methods to solve each equation. Show all the steps and verify the solution.

a. $4x + 5x = 27$

b. $3a + 2 = 20$

c. $5m = 25$

d. $r - 8 = 19$

e. $\frac{d}{2} = \frac{3}{5}$

Part 3 Response Page

1. a. $x = 3$

b. $a = 6$

c. $m = 5$

d. $r = 27$

e. $d = \frac{6}{5}$ or $1\frac{1}{5}$

Part 3 (continued)**22**

2. Check the solutions given for the following equations. If the solutions are incorrect, solve the equation correctly using paper and pencil methods. Show all the steps and verify the solution.

a. $14x + 11x = 7.5$, $x = 3$

b. $j + \frac{1}{2} = \frac{3}{4}$, $j = 1\frac{1}{4}$

c. $5p - 1.2 = 3.8$, $p = 1$

d. $0.7d = 1.4$, $d = 2$

e. $\frac{3}{a} = \frac{2}{5}$, $a = 4.5$

Part 3 Response Page (continued)

2. a. The solution is incorrect; $x = 0.3$.

b. The solution is incorrect; $j = \frac{1}{4}$.

c. The solution is correct.

d. The solution is correct.

e. The solution is incorrect; $a = 7.5$.

Part 3 (continued)**8**

3. The rental costs at two car rental agencies are based on the total distance driven in kilometres and a basic daily charge.

The rental cost at Triple A Company is \$0.08 for each kilometre driven plus a basic daily charge of \$20.00.

The rental cost at OK Company is \$0.06 for each kilometre driven plus a basic daily charge of \$24.00.

- Write an equation to describe each relation.
- Janice intends to rent a car for two days and she intends to drive a total distance of 500 km. From which company should she rent a car?

10

4. a. Give the next three terms in this sequence:

7, 9, 11, 13, , , 

- Give the fiftieth term of the sequence.

Part 3 Response Page (continued)

3. a. $t = 0.08k + 20d$

$$o = 0.06k + 24d$$

b. The cost from Triple A Company is \$80.

The cost from OK Company is \$78.

Janice should rent from OK Company.

4. a. 7, 9, 11, 13, 15, 17, 19



b. You can use this expression to find the fiftieth term:

$$1 + (n - 1) \times 2$$






The fiftieth term is 99.

Page 3 (continued)






20

5. Each  represents a different number. Find the value of each .
Hint: the exponent is either 1 or 2.

a.

m	 m  $- 1$
1	3
2	7
3	11
4	15
5	
6	
7	

b.

m	 m  $- 1$
1	1
2	7
3	17
4	31
5	
6	
7	

Part 3 Response Page (continued)

5. a.

m	$\boxed{4} m^{\boxed{1}} - 1$
1	3
2	7
3	11
4	15
5	$\boxed{19}$
6	$\boxed{23}$
7	$\boxed{27}$

Pattern

$\} + 4$
 $\} + 4$
 $\} + 4$
 $\} + 4$
 $\} + 4$
 $\} + 4$

b.

m	$\boxed{2} m^{\boxed{2}} - 1$
1	1
2	7
3	17
4	31
5	$\boxed{49}$
6	$\boxed{71}$
7	$\boxed{97}$

Pattern

$\} + 6$
 $\} + 10$
 $\} + 14$
 $\} + 18$
 $\} + 22$
 $\} + 26$

$\} + 4$
 $\} + 4$
 $\} + 4$
 $\} + 4$
 $\} + 4$

Total for Part 3 = _____ (Maximum possible: 80 marks)

Part 3 Response Page (continued)

Use the table below to find the value of the expression for each value of x .

x	Value of Expression
1	1
2	7
3	13
4	19
5	25
6	31
7	37

Pattern: $6x - 5$

x	Value of Expression
1	1
2	7
3	13
4	19
5	25
6	31
7	37

Pattern: $6x - 5$

Total for Part 3: _____ (Maximum possible: 20 marks)



MATH 8

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